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Faraday

AFTER all that has been said, heard, and written about Faraday's life and work, what can there be left in this week of weeks to add to the volume of tribute paid to his memory, not only in this country, but in all civilised countries whose prosperity depends upon the outcome of the genius of this Englishman?

An answer was provided by the Prime Minister in his eloquent address at the commemorative meeting held at the Queen's Hall last Monday, when he emphasised the importance of the human side of Faraday. We, whose chief working interest in life and whose livelihood depend upon the fruits of Faraday's discoveries, have perhaps been inclined to stress the material aspects of his life to the exclusion of the man himself, but of no one can it more truly be said that the man was greater than his work. Those who, on Monday, listened to Mr. Ramsay MacDonald, Sir William Bragg, and the other speakers, felt that it was no exaggeration to say that, great as have been the benefits that have sprung from his genius, the influence of his personality has been even greater.

The truly epoch-making discoveries of Faraday, which have changed the direction and expedited the course of evolution during the past century, would no doubt have been made in the fullness of time by another or others—but how much poorer would the world have been for the delay, and how different all our material environment would have been! The character of Faraday, the man, was, to his own generation, and has been to thoughtful men right up to our own time, an inspiration that can rarely have been equalled—a heritage to the youth of his own and all lands.

Genius has been defined as an infinite capacity for taking pains. This definition may be incomplete and unsatisfactory, but this quality did form the basis, at any rate, of Faraday's work, for, without his capacity for patient methodical investigation, he would not have gained the mastery over detail which enabled him so brilliantly to synthesise his experiments, nor the power of lucid explanation that caused his theories to be so readily accepted. But Faraday was much more than a conscientious experimenter who faithfully discharged his duty. He had the advantage of a strongly religious cast of mind. By this we do not mean the formal expression of the religion that seemed right to him; we mean the whole outlook of the man who always thought far more of his work and of how it would benefit mankind than of any material reward it might bring to himself, and who was unfailingly considerate of those with whom he came into contact. His deep reverence for nature also powerfully influenced his philosophical attitude in that it filled him with a belief that the various forces of nature were related, which, as Lord Rutherford stated, gave the impulse and driving power to most of his researches.

It was Carlyle who said that the man was happy who had found work congenial to him, and that such a man need ask for nothing more. Faraday was a noble example of the truth of that saying. Yet, enthusiast as he was, he always remained the master of his work, and never allowed himself to become enslaved to it. Thus, he retained a flexibility of mind that made him at all times ready to receive new ideas, so that we may well believe that were he to come among us to-day he would find little difficulty in appreciating the significance of current scientific ideas.

Coats Off for Export Trade!

BRITISH manufacturers, especially those in the electrical world, will surely see to it that the spirit of lethargy—so dangerously prevalent, we fear—is not allowed to find its way into their export-trade organisations. The very times themselves cry out against it as folly. The position of affairs demands more genuine schemes, and greater efforts, than ever before; the last thing that should be done is to abandon good intentions formed before the clouds became so heavy, or to defer the introduction of new movements until the heavens brighten We notice that Sir Francis Goodenough has been urging the setting up of more missions, or committees, to take quick action, to scour each of the principal customer countries of the world, and to report on the possibilities. The suggestion is the despatch to many markets of missions of the type already sent to a few—they are to comprise a mixture of business men and experienced Government trade officers. "Economy" is the watchword just now, of course, and extravagance must be emphatically condemned, but it has been so convincingly urged a hundred times that money well spent upon export trade expansion efforts brings an abundant return, that we should be among the last to belittle Sir Francis's suggestion. But our traders know that neither in these serious times, nor at any other, would they be acting wisely to leave such things to Governments. Every firm that wants to do better business must take its own action—joining hands with fellow-manufacturers if it can—but in any case doing something. Their Trade Press will be there if they are not! In many a market those on the ground ready to take immediate advantage of a favourable movement directly it occurs will secure the trade. While Governments evolve policies none of our overseas trade weapons must be allowed to rust!

Power in Industry

IN our leading article of March 6th we urged that present conditions provided an opportunity for our industry to assist less fortunate trades by taking active steps to encourage an increased use of electricity for motive power purposes. Our recent review of the Census of Production relating to the engineering trades has brought us some suggestive correspondence, in which it has been pointed out that the average price of electricity for motive power purposes only is less than half of what it was ten years ago. Average price is a rough criterion, as it makes no allowance for local factors; moreover, in the case of power consumers, it makes no allowance for the possible effect of a few large factories. The general average price for motive power is, also, unduly weighted by the fact that only in a very small proportion of the undertakings is a lower figure obtained. Low prices, however, are not the only requisite for the development of the industrial load. Facilities for works equipment and information regarding potential loads of a more up-to-date character than those available will also be necessary.

Misuse of Load Factor

It is inconceivable nowadays that the supply engineer could run his business efficiently without the aid of that ingenious invention, "load factor." This device—term is inadequate—has proved a compensation for effects arising from the unfavourable peculiarity inherent to electricity generation and distribution, when compared with other services. It also indicates the only path to adequate commercial development. But an excellent tool in inexperienced or misguided hands is often dangerous. The use of the factor by prospective and existing consumers breeds confusion, and turns the simple into the complex. Its indiscriminate use by many inside the electrical industry also leads to, at least, the same result. Load factor is the delicate scientific instrument of the supply man, and its safe-keeping is his responsibility.

The Institution Building

THE I.E.E. Building should be seen from Waterloo Bridge. The illuminated finials have a most striking appearance viewed a little this side of half-way across, while the effect of the general flood-lighting can be seen better from the relatively high position than from the Victoria Embankment. The finial lighting was a particularly happy idea, and might well be copied as a decorative scheme for some of the larger buildings in provincial centres that may not, for one reason or another, lend themselves well to flood-lighting. We have expressed the hope that the present striking illuminations will not be regarded merely as an *ad hoc* demonstration. Will the I.E.E. set the example of permanency?

The B.A.

THE celebration of the Centenary of the British Association for the Advancement of Science brings back to memory some of those great occasions of the past when the "B.A." Congress was the one outstanding scientific event of the year. Few of the now so numerous electrical societies and institutions were in existence, and, of course, such conventions as those of the I.E.E., the I.M.E.A., the Contractors, the Tramwaymen, and so forth, were events that could not be foreseen any more than the wonderful course of the electrical profession and industry could have been predicted. All the élite of the scientific world attended the B.A. in those days; great discoveries were announced to distinguished assemblies in the sections; the international authorities met together for profound discussions on electrical units. Statesmen and scientists hobnobbed together—Salisbury and Balfour, Kelvin and Ramsay, men of eminence from Europe, engineers of renown—all found it well worth while attending these annual reunions. The Association had the field almost entirely to itself then. Only later did it become the target for criticism because it showed a tendency to become an annual picnic, and its sectional meetings were attended by but a handful of visitors. The rise of the sectional institutions and societies have to some extent superseded the B.A. as we once knew it. During the hundred years of its existence, however, it has been a great organisation, and has provided a platform whereon the men of all nations could add their contributions to the general popularisation of scientific knowledge. Regarding this year's meeting, we can only say here that the brilliant survey of present scientific tendencies by the President, General Smuts, worthily maintains the traditions of the Association.

International Science

NOTHING brings home to a greater degree the essential unity of the interest of different nations than the work of a great scientist. The understanding tributes so generously paid to the work of Faraday this week provide evidence that that it so. This view has been further emphasised during the past few days by Colonel Crompton and Mr. le Maistre, who speak with the authority of those whose work has provided them with foreign contacts that have been valuable not only to themselves but to their fellow-countrymen. They strongly emphasised the importance of friendships formed between scientists from all countries, and we think their claim that the International Electrotechnical Commission, as a factor in the promotion of world understanding, is second not even to the League of Nations is by no means extravagant. This claim, we understand, receives the support of no less an authority than Sir Eric Drummond, the Secretary-General of the League.

The Tribute to Faraday

Commemorative Meetings at Queen's Hall and Kingsway Hall; the I.E.E. Programme; the Albert Hall Exhibition; and the Centenary Meeting of the British Association

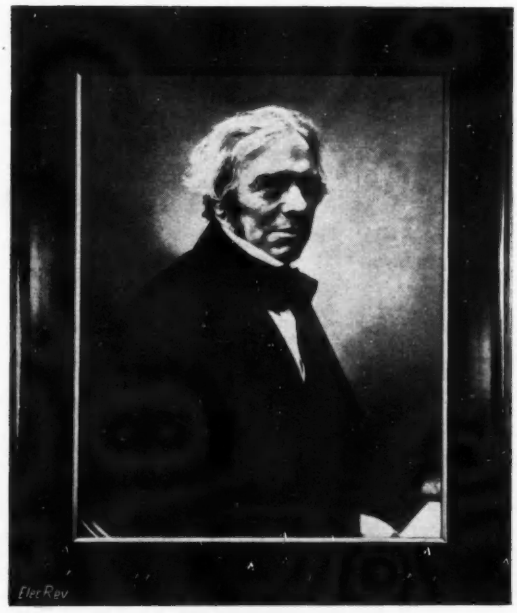
THE Commemorative Meeting at Queen's Hall on Monday (arranged by the President and Managers of the Royal Institution and the council of the Institution of Electrical Engineers) was probably the most distinguished gathering that has ever been held for the purpose of doing honour to a man of science, and certainly the largest if we include the audience reached by the B.B.C. The presence of the Prime Minister, at a time of national crisis, lent a dramatic emphasis to the public appreciation of the significance of a great Englishman's work, while the inclusion among those taking part of General Smuts and of so many eminent foreigners signalised the international aspect of scientific discovery.

The B.B.C. Promenade Concerts had been suspended for the evening, but Sir Henry Wood's orchestra was in attendance, and provided a brief but well-selected musical programme.

The Prime Minister's Address

The opening address was delivered by the Rt. Hon. J. Ramsay MacDonald, F.R.S., M.P., who disclaimed any ability to speak of Faraday as a man of science. He paid an eloquent tribute to him as a man with a glowing strong personality whose life had always been an inspiration to himself as it had been, and would be, to the youth of all generations. Faraday, he said, was a man of enthusiasm, who had lived with his heart as well as with his head. Like many men who had succeeded in leaving their mark on the world, Faraday's mainspring was not ambition but the simple-minded and faithful discharge of his duty

He was one of those men who appealed to the constituency of his heart, to the parliament of his own conscience. Another characteristic of Faraday was his reverence for nature, his fellow beings, and his work. Like all vital individualities he was full of apparent contradictions—and only a miserable being had none. He was, in short, one of the greatest personalities that has ever called himself an Englishman.



Michael Faraday
(From a photograph in the "Electrical Review" of July 15th, 1877.)

Eminent Scientists' Contributions

Then followed tributes from representatives of all phases of science who owe their present position to Faraday's discoveries. The Duc de Broglie (Member of the Institute of France) expressed the admiration felt by modern men of science for the perfection of Faraday's experimental work, having regard to the poor resources at his disposal, and for the astounding variety of the manifestations of his genius. Of all the physicists of the nineteenth century it would be Faraday who would find himself most at home among modern scientists.

The Marchese Marconi, G.C.V.O., said that the seed from which wireless had sprung was the fundamental discovery of Faraday, followed as it was by Clerk Maxwell's splendid dynamical theory of the electromagnetic field and his theory of electric waves. Broadcasting, which arose out of this work, had become a social and educational factor whose future effects were still difficult to estimate. Radio, especially since the advent of short waves, provided a new force destined to take an even more decisive part in the progress of human civilisation. It permitted the best and most natural means of intercourse between human beings—the spoken voice—and led to a reciprocal knowledge between nations, thus favouring peace.

Large-scale Electrical Developments

Prof. Elihu Thomson spoke mainly of the present day large-scale developments of electricity. He referred to the slow progress made, from the present standpoint, in the application of Faraday's principles. This he attributed to the fact that, although the principles of generation and transmission had long been known, major developments had to await the establishment of large power stations and the provision of a great mileage of conducting lines therefrom so that the desired supply of electricity might be brought to those who needed it.

Prof. P. Zeeman referred to the discovery made by Faraday in 1845, that the plane in which vibrations of light take place is rotated when the light passes through certain substances parallel to the magnetic lines of force. The relation between light and magnetism always continued to occupy Faraday's mind, and was the subject of his last experiments in 1862. That he was not entirely successful was due to the inadequacy of his resources, and it was not until 1896 that Prof. Zeeman himself discovered that the spectrum lines of a source of light were characteristically modified by placing the source in a strong magnetic field.

Prof. P. Debye discussed the effect on Faraday's outlook as a physicist of his chemical training, which enabled him to see a fundamental connection between chemistry and electricity. He said that the world was now awaiting the man who would do the next great thing in the realms of atomic theory.

Lord Rutherford's Appreciation

Lord Rutherford of Nelson, O.M., F.R.S., said that Faraday's collected researches showed not only his remarkable powers of physical insight and genius, but also the clarity and vigour of his exposition. The discoveries upon which were founded the great electrical industry of to-day were only one of a number of great contributions made by Faraday to different branches of science. It was not easy to-day to appreciate the primitive conditions under which Faraday carried out his earlier experiments. Ohm's law was unknown, and no methods were available for measuring current, voltage, or resistance. His faith in the experimental method was accompanied by a distrust of the mathematical theories of the day, based on electrical and magnetic forces acting at a distance. It seemed almost fortunate that Faraday had had no mathematical training, for its absence led him to form concrete views of electrical and magnetic actions. Faraday's powers as an experimenter were shown most clearly in his analysis of the laws governing the passage of electricity through electrolytes. He was also on the verge of the discovery of the discrete or atomic nature of electricity—an idea which did not gain general credence until fifty years later.

Sir William Bragg's Address

The Commemorative Address was delivered by Sir Wm. Bragg, O.M., K.B.E., F.R.S. He said that we were, at our point of time, owing to its distance from the subject, able to appreciate more accurately Faraday's work than ever before.

The famous experiment of August 29th, 1831, led to the discovery not of a single law but of a code of laws, all part of a comprehensive effort to discover the unity of the forces of nature. Sir William quoted from a letter he had received from Prof. Einstein, who expressed the opinion that future generations had as much to learn as had been learned in the past from Faraday's conception of the electromagnetic field.

The value of his material works at the Albert Hall could be more easily weighed than that of his character. It was often difficult to see the sequence between the growth of knowledge and its effects, and sometimes alarm was expressed lest the world should become mechanised.

The proceedings closed by a few remarks by the Rt. Hon. Lord Eustace Percy (President of the Royal Institution).

Proceedings at the Kingsway Hall

THE Institution of Electrical Engineers' proceedings opened on Tuesday morning with the delivery at the Kingsway Hall of a series of five discourses on "The Place of Electricity in the Production and Utilisation of Power, and in Transport, Communications, and the Household," all the speakers bearing upon the material part Faraday played in the advancement of electrical engineering science, and the directions in which his discovery has affected many phases of modern life.

The Royal Institution

Mr. C. C. Paterson (President of the I.E.E.) occupied the chair, and extended a cordial welcome to the distinguished delegates who had assembled at this exceptional time. He took their presence there not only as a tribute to Faraday, but also as a sign of their friendliness to this country.

Power

Mr. J. S. Highfield's subject was "Power and Engineering Science." Only one generation had really known the advantage of power, widely distributed and available to all. Former resources were few and requirements small; civilisations had been built up and had died on the flow of water and the revolving wheel. Almost unlimited power existed in the wind, and means might yet be found of using it (storing it especially) when heat fuel had been exhausted; similarly, the power and energy of the tides might one day be used. The desire to reduce labour generally was the factor which had made full use of power to-day; but too much power might have its difficulties. Unlike Faraday's discovery, that of the steam engine had a commercial object; new uses found for the steam engine helped its development, and it was still proceeding at a rate which we could not yet appraise. Electricity had been known before Faraday, but he discovered how to make it common to all, and made possible its concentrated generation and distribution in large and small bulks. The capital invested in public undertakings alone in this country was over £350 millions. Even so, we were but at the beginning. Our methods were elaborate and costly. Already wireless communication was pointing to other ways. The modern world had its perfections and imperfections, for man had not used the machine he had devised to the best advantage. To overcome those difficulties we must follow Faraday's method of continually seeking after the truth.

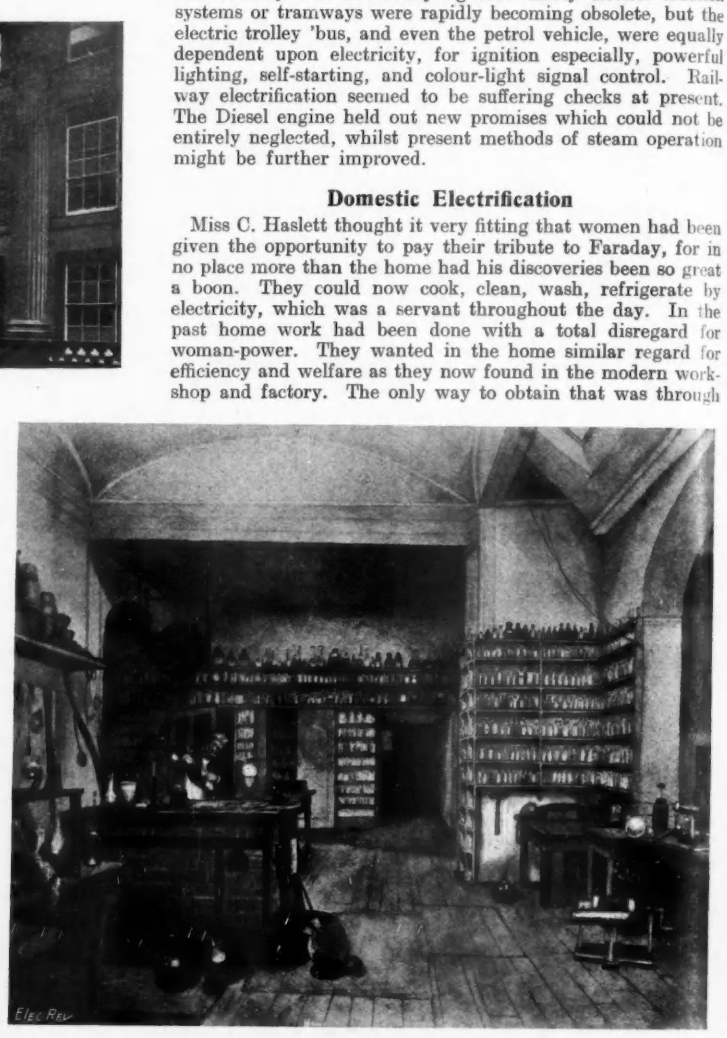
Transport

Sir Josiah Stamp traced the influence of Faraday's discoveries on transport. Telegraphy was the first application of electricity to transport, first used for signalling at Euston. The public treated it with disdain, but that method of signalling was subsequently used at Paddington, and developed into the North-Western block system. Long after it went on along the line, for lighting, ventilation (fans), cooking, and many other uses. To-day, 60 per cent. of the railway stock in this country was electrically lighted. Early electric traction systems or tramways were rapidly becoming obsolete, but the electric trolley 'bus, and even the petrol vehicle, were equally dependent upon electricity, for ignition especially, powerful lighting, self-starting, and colour-light signal control. Railway electrification seemed to be suffering checks at present. The Diesel engine held out new promises which could not be entirely neglected, whilst present methods of steam operation might be further improved.

Domestic Electrification

Miss C. Haslett thought it very fitting that women had been given the opportunity to pay their tribute to Faraday, for in no place more than the home had his discoveries been so great a boon. They could now cook, clean, wash, refrigerate by electricity, which was a servant throughout the day. In the past home work had been done with a total disregard for woman-power. They wanted in the home similar regard for efficiency and welfare as they now found in the modern workshop and factory. The only way to obtain that was through the agency of electricity, yet in this country only 32 per cent. of the existing houses were wired.

Why had not more progress been made? Chiefly for the three following reasons: (1) Many people had the false idea that electricity was expensive for anything but lighting, whereas actually in many parts of the country it would compare very favourably with other fuels. We had no very definite figures and the public had a very hazy idea of its cost. (2) Houses were not wired when built, and it was not always possible for apparatus to be obtained on easy terms.



Faraday in the Royal Institution Laboratory
(From a painting by Harriet Moore)

The Platform at the Kingsway Hall Meeting.—Miss Haslett, Sir Josiah Stamp, Sir Oliver Lodge, Mr. C. C. Paterson, Mr. Ll. B. Atkinson, and Mr. J. S. Highfield

(3) The public had a curious fear of electricity, and a great lack of knowledge of what it could, and did, do. We used curious and involved phraseology in which to wrap up our apparatus. There seemed to be a real need for the training of women as electrical advisors to the housewife, and for training in electrical housecraft, in which respect domestic servants would benefit a great deal.

The Future Apartment-house

Mr. Ll. B. Atkinson explained how, prior to the "industrial revolution," a small ruling class was able to live a life of culture, because the work necessary to feed, to clothe, to support, and protect it was done by slaves, or a servant class. Now that everyone received an education, the ineffective and backward organisation and performance of household duties was viewed as distasteful and rather degrading? What was the alternative: was it possible to live a life of leisure and opportunity for culture without servants? Why really should we expect, in the world as we hoped to see it, certain classes reserved to do the unpleasant drudgery work for other classes? That was what men and women had to earnestly consider. Could it be avoided? The answer was that it could be, and was being, done. It was a matter of planning, of proper design of the house, and being trained to use and being proud to use what science had to offer. The richer classes overcame the difficulty by living in hotels and service flats where, owing to the greater bulk of the tasks to be performed, it was worth while to instal machinery; for the middle and operative classes he envisaged blocks of flats where every operation and task that could be done mechanically, which meant electrically, would be so done in spacious and convenient kitchens, laundries, and sculleries, etc., by the residents in the apartment house taking their turns. Thus in living rooms with central heating and electric fires for local heat, only the minimum of family work would be done. What a gain in health and comfort! He estimated that a woman who now worked almost continuously all day and every day would only need to put in the equivalent of two days' work each week in such an organised home. He earnestly suggested that some of those, particularly women who are thinking and working to face modern domestic problems, should give such a plan their serious consideration.

At the beginning the plan must apply to young and modern middle-class people, but if once it took on in such a stratum of society it would spread downwards automatically.

Communications

Sir Oliver Lodge commented on the smallness of the fact which Faraday discovered and its enormous consequences, developed by electrical engineers, whose attention he had turned from matter to the space which surrounded it. All Faraday did was to move a wire through a field of force, thus showing that it was the space which mattered. The whole tendency of physics to-day was to explore space, or the ether, to discover what force lay therein. Matter itself was inert and took the line of least resistance. The fact of importance was the disturbance of the ether, which produced radiation. Matter had many imperfections and turned into heat sooner or later, but ether had no imperfections and did not deteriorate. There was a sense in which ether vibration might become permanent, for instance, the light of the stars reached us many light-years after its emission. It was a queer fact that all stars seemed to be moving away from us, which fact had given rise to the notion that the universe was expanding (a subject to be discussed at the B.A. meeting). Near our earth the ether was incommoded by particles of matter, which fact had enabled electrical communication to be established.

Sir Oliver then continued to describe how long-distance communication difficulties had been overcome; the devising of super-sensitive receivers to detect feeble signalling, and present methods of loading cables were described, and the part which metallurgy had played in this respect. Electrical means of communication were already welding nations more closely together. Let all engineers help as much as they could to further that aim.

Mr. C. C. Paterson, in winding up the proceedings by reviewing the pictures which the various speakers had drawn of Faraday and his work, particularly focused attention on Faraday as a man. They had met to remind themselves of what they owed to Faraday, who had a supreme reverence for truth, and had the greatest delight in explaining to others that which was so much to himself. Others also had been inspired by similar ideas, but Faraday's unusual experimental ability had never been surpassed. His sureness of some underlying force of unification enabled him to arrive at the truth sooner than others might have done. He made science of popular appeal, and inspired others to take it up.

We reproduce below a number of photographs taken before and during Tuesday's meeting.

The Kingsway Hall Gathering: 1, Mr. F. W. Purse; 2, Miss Haslett and Lady Moir; 3, Sir Oliver Lodge; 4, Sir James Crichton-Browne; 5, Miss Bornemann and Dr. A. Enström; 6, The Audience; 7, Mr. and Mrs. Michael Faraday.

The I.E.E.'s Busy Week

Works visits around London, and excursions to Windsor, Reading and Oxford

FOLLOWING its morning Kingsway Hall conference, the programme arranged by the Institution of Electrical Engineers, in place of the usual summer meeting, commenced on Tuesday afternoon with a series of visits, according to choice, to (i) the Brookmans Park dual-wave transmitting station and the British Broadcasting Corporation; (ii) the mail-transporting tube railway of the Post Office, which is automatically operated electrically and connects the chief sorting offices with eight main-line railway termini; (iii) the new Deptford generating station of the London Power Co., Ltd.; (iv) the overhaul and repair depôt of the London General Omnibus Co., Ltd., at Chiswick; or (v) the Camden Town tobacco and cigarette factory of Carreras, Ltd., and the electric heating and lighting installations in the new reptile house at the Zoological Gardens.

On Tuesday evening the annual I.E.E. conversazione took place at the Royal Albert Hall. Music was provided by the string band of the Royal Engineers and Prof. W. Cramp lectured on "The Birth of Electrical Engineering." The president and Mrs. C. C. Paterson, supported by members of the Council, received members and guests, who thus had an opportunity of inspecting the unique collection of exhibits prior to the private view on the following (Wednesday) morning which preceded the official opening of the Faraday Exhibition, which ceremony was broadcast by the B.B.C.

Yesterday (Thursday) there was a series of whole-day excursions. One party travelled to Oxford by train and visited the various colleges. After luncheon the Cowley works of Morris Motors, Ltd., were inspected and tea was provided by the company. A second party went by road to the Gravesend factory of W. T. Henley's Telegraph Works Co., Ltd. After luncheon the 132-kV grid transforming sub-station of the Central Electricity Board was inspected on the return journey, as were also part of the route of the 132-kV cable between Eltham and Deptford and a 66-kV transforming station.

A third party drove to the Barking generating station of the County of London Electric Supply Co., Ltd., and after luncheon embarked at the power house jetty on the S.Y. *St. Katharine* for a tour of the London docks; tea was provided on board by the Port of London Authority.

The fourth excursion was by rail to Windsor Castle in the morning, proceeding by train to Reading to inspect the biscuit factory of Huntley & Palmers, Ltd.

A fifth contingent motored to Teddington in the morning and after inspecting the twelve buildings of the National Physical Laboratory, whose staff has grown from 30 to 600 since its foundation in 1900, spent the afternoon in Hampton Court Palace and grounds, luncheon and tea being partaken of in the old Tilt Yard gardens.

To-day (Friday) more whole-day visits have been arranged to the Osram-G.E.C. lamp and M.O. radio valve factories at Hammersmith, and after luncheon to the company's research laboratories and glass and lamp works (No. 7 factory) at Wembley.

Another section will visit the Erith works of Callender's Cable & Construction Co., Ltd., in the morning and Fraser and Chalmers, Ltd., turbine and engineering works in the afternoon.

A third party will have an opportunity of seeing the Woolwich works of Siemens Brothers & Co., Ltd., and, after luncheon, Messrs. Bowater's paper mills at Northfleet.

Another party will visit the carriage overhaul depôt of the Underground Electric Railway Co. at Acton and proceed in the afternoon to the factory of the Gramophone Co., Ltd., at Hayes.

A fifth contingent may inspect the Brimsdown power station of the North Metropolitan Electric Power Supply Co. and the Hendon works of Standard Telephones & Cables, Ltd.

These activities will terminate with a supper-ball at Grosvenor House, Park Lane, to-night.

The Forum Club, which is one of the foremost women's clubs in the country, is entertaining the ladies who are attending the Faraday celebrations at dinner this evening. The guests are to be received by the directors and members of the Executive Committee of the Club. Miss C. Haslett, director of the Electrical Association for Women, who is also a director of the Forum Club, will preside at the dinner, which is being held at the same time as the Government dinner for the men delegates, and it will end in time for the ladies to attend the Faraday ball.

Personalities at the Queen's Hall meeting: 1, The Duc de Broglie and Sir William Bragg; 2, The Faraday Statue at the Exhibition; 3, Col. and Miss Crompton; 4, Lord Eustace Percy (President of the Royal Institution); 5, The Prime Minister with Lord Rutherford and others on the platform; 6, Lt.-Col. W. A. Vignoles.

The Faraday Exhibition

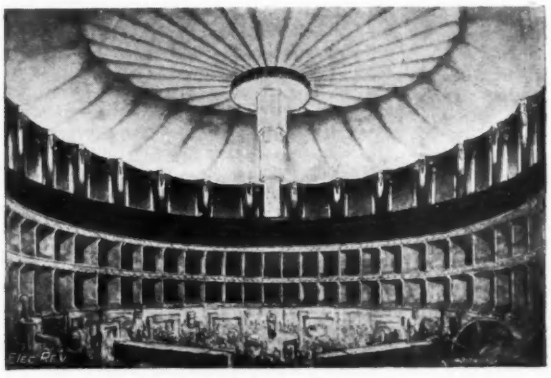
A unique display illustrating the outcome of the fundamental discoveries of the pioneer whose centenary is being celebrated

NOT a lamp is visible in the exhibition, but a flood of light produced by electricity glorifies the British discoverer of the means of its generation. A cleverly planned E.L.M.A. illumination scheme distinguishes this show. Suspended from the dome of the Royal Albert Hall by 300 steel cords is a specially woven striped canopy over a quarter of a mile in circumference and 80,000 square feet in area. Beams of powerful light from over 250 projectors concealed around the circular gallery are trained on to the suspended canopy, and the resulting reflected light, equivalent to the illumination of half a million candles, or 300 electrical horse-power, bathes the elliptical arena in shadowless light.

Besides the large central fitting, thirty-two decorative half-lanterns have been placed on the pillars round the gallery. In the body of the hall there are also eight illuminated arches situated in a ring approximately half way out from the centre. Some idea as to the extent of the scheme may be gathered from the fact that the lighting load is over 250 kilowatts.

The exhibition stands radiate from a central raised platform on which stands a statue of Michael Faraday, the dais incorporating illuminated displays of his personal relics. Heading each of the eight sets of radial stands, and facing the statue, are demonstrations arranged by the Royal Institution to show actual experiments conducted by Faraday when making his fundamental discoveries. Outside this ring radiate the numerous exhibits of the many applications of electricity, not merely illustrative of past development, but also of the present most modern methods of application.

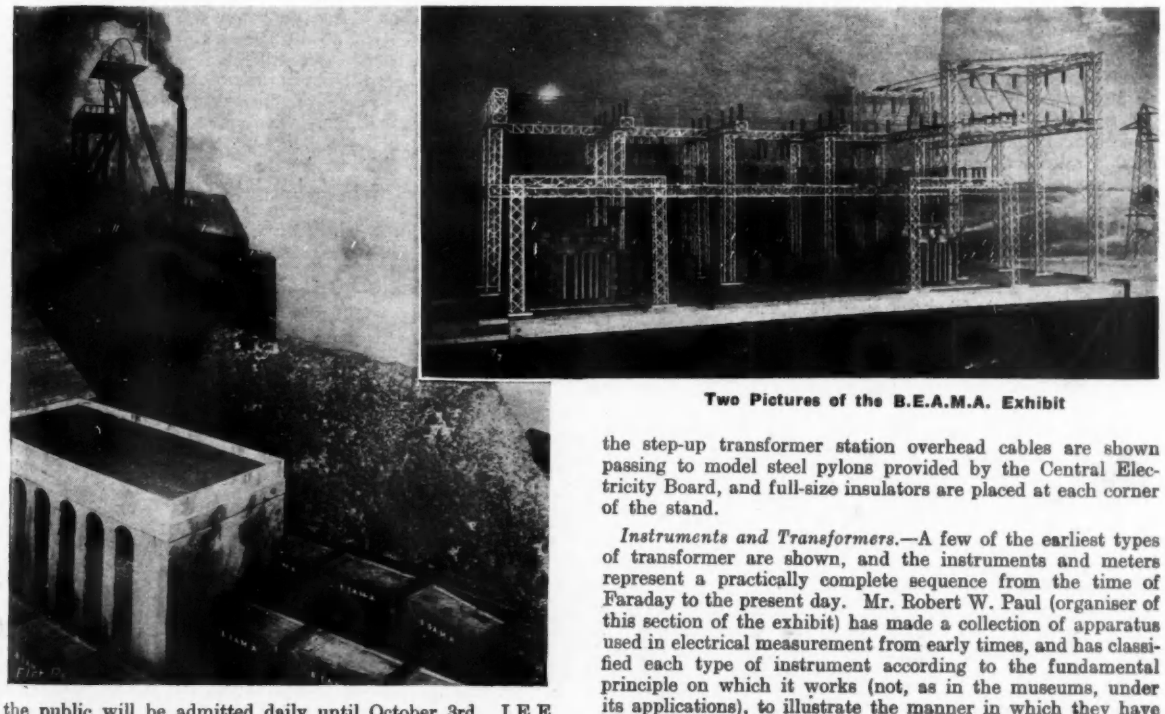
The exhibition has been organised by the Institution of Electrical Engineers, which voted £10,000 towards its cost, which will total about £20,000. It was opened by Lieut.-General J. C. Smuts, P.C., F.R.S., on September 23rd, and the public will be admitted daily until October 3rd. I.E.E. and University students will demonstrate the exhibits.



The B.E.A.M.A. Display

The exhibits of the British Electrical and Allied Manufacturers' Association deal with electricity generation and its measurement, and a working model of a power station, 45 feet long by 5 feet wide, has been constructed to show in detail the process of generation from the delivery of coal from the pit head to the transmission-line pylons of the grid system. The display of measurement apparatus forms a complete historical record, and in the main entrance are a few examples of old generating machines (1865-1890).

Power Plant.—At the back of the stand, coal is shown being delivered from the pit shaft by rail to the boiler house, where it is elevated to overhead bunkers by a working model. The boilers are of the pulverised-fuel type, with separate pulverising mills, etc., the front wall being of glass, so that the "flames" can be seen. Steam is shown flowing through glass tubes to the turbine, the effect being produced by a combination of air bubbles and a liquid. The casing of the model 25,000-kW. turbine and alternator is cut away, and the rotor can be seen revolving, while in the condensing plant water is shown flowing from the river by means of a liquid arrangement similar to that adopted for the steam pipes. From the alternator to the switchgear and outdoor transformer station the connecting cables are represented by neon tubes. From the step-up transformer station overhead cables are shown passing to model steel pylons provided by the Central Electricity Board, and full-size insulators are placed at each corner of the stand.



Two Pictures of the B.E.A.M.A. Exhibit

Instruments and Transformers.—A few of the earliest types of transformer are shown, and the instruments and meters represent a practically complete sequence from the time of Faraday to the present day. Mr. Robert W. Paul (organiser of this section of the exhibit) has made a collection of apparatus used in electrical measurement from early times, and has classified each type of instrument according to the fundamental principle on which it works (not, as in the museums, under its applications), to illustrate the manner in which they have developed from the discoveries of certain fundamental principles, each of which was discovered and its importance enforced by the work of some man; the method he adopted for its illustration is shown, then the steps in the subsequent modifications made to meet the needs of investigators and engineers, concluding with examples of modern practice.

Faraday Talking Film

A talking kinematograph film has been produced by the British Thomson-Houston Co., Ltd., and given to the I.E.E. Exhibition Committee, in which Sir Wm. Bragg tells the story of Faraday's humble origin, his work as a journeyman bookbinder, his appointment as a laboratory assistant at the Royal Institution at 25s. a week with two rooms at the top of the house, and his subsequent epoch-making work as an experimenter and philosopher. The film is being publicly exhibited in many towns.

The E.D.A. Exhibits

Domestic Section.—Organised by the British Electrical Development Association, Inc., this exhibit is specially designed to impart to visitors an appreciation of the improved hygiene and comfort which can be enjoyed in the modern home as a

direct result of Faraday's discovery. In the background on a screen 36 ft. long by 12 ft. high, is a series of coloured and illuminated cartoons illustrating such domestic operations as cleaning and cooking, while the electrical comforts portrayed are in marked contrast to the discomforts which people were compelled to endure in their homes one hundred years ago. Immediately in front of the screen a representative collection of modern domestic electrical appliances is arranged for easy inspection; visitors can obtain from the attendants such information regarding their cost, and cost in use, as may be desired.

Industrial Electric Heating Section.—This stand has been organised by the E.D.A. Industrial Electric Heating Committee, and the practical working demonstrations will make a marked impression upon visitors of the very extensive use now made of electric heating by almost every branch of industry, in which it has been found that the clean, constant, accurately controlled electric heat not only reduces overall manufacturing costs, when compared with the use of solid or liquid fuels, but also produces an article which is more reliable and of superior finish.

Amongst the operations which can be seen working are rivet heating and spot welding; a steel hardening furnace with automatic control which indicates to the operator the exact temperature at which the parts being hardened require to be quenched; and an air heater capable of delivering 8 cu. ft. of air per second, at a temperature of 500° C., suitable for use in foundries, for the treatment of varnish and lacquer, and for the desiccation of tea, fruits, rubber, etc.

A complete electrode boiler with pump, feed tank, and control, for raising 240 lb. of steam per hour with alternating current, will be working. Metal melting by means of a high-frequency induction furnace is demonstrated in a separate room in the basement. Souvenir miniature reproductions of the bust of Faraday are being cast from the furnace, and will be on sale at the exhibition.

In addition to the working exhibits, there are to be seen examples and models of electric muffle furnaces, rotating-hearth type pottery kiln, fresh water distiller, electrode type water heaters, soldering irons and several types of smoothing irons.

Electro-chemical Industries

Electroplating, an important branch of electro-deposition, which owes much to the work of Michael Faraday, who first enunciated the laws of electrolysis and devised much of the nomenclature which persists to this day, is the art of imparting an adherent metallic coating to materials for decorative purposes, to prevent corrosion, and to improve their wearing properties. It is effected by immersing them in a solution of metallic salts through which an electric current is passing. The materials to be coated are usually, but not always, metals themselves, while metallic coatings may be deposited, not for the sake of securing their adhesion to the underlying material or base, but with the object of detaching them and subsequently using the deposit as a replica. Such processes are exemplified by galvanoplasty, or electrotyping. The electro-deposition of metals is also applied to the local building up of worn parts, and for the purpose of joining surfaces, and filling up cracks or holes in defective metal parts.

The exhibits arranged by the Electroplaters' and Depositors' Technical Society consist of representative models of plant, wherewith the above-described processes are accomplished, together with specimens of finished work.

The Royal Mint has lent a collection of specimens of various applications of electroplating.

Production of Metals

The stand of the British Non-ferrous Metals Research Association exemplifies the many benefits conferred upon industry by the electrolytic production of metals. Electrolytically refined copper is vital to the whole electrical industry, and about 1½ million tons per annum is now produced. Again, aluminium, which has advanced in recent years more rapidly than any other metal, and has attained an output of over 267,000 tons per annum, is entirely produced by electrolysis. Many other metals also are commercially produced on a large-scale by electrolysis, either on account of the greater purity thus achieved, or because their reduction by other methods is difficult.

Other Chemical Applications

Largely as a result of Faraday's researches electrolytic methods are now applied very widely in the manufacture of a variety of chemical products, as well as in the metal industries, and a few exhibits illustrate some of the methods used.

Although it is only indirectly connected with the electro-chemical industries, in this section is shown the working of the mercury electrolytic meter (or coulommeter) for measuring supplies of electricity. It consists of a sealed electrolytic cell of ingenious design, containing a solution of the iodides of mercury and potassium. The anode is of mercury, which dissolves in proportion to the current that passes, and the same amount of mercury is evolved at the cathode and falls in minute globules into a measuring device. The fact that currents can be measured reliably in this way is a good example of the accuracy of Faraday's laws of electrolysis.

Gaseous Discharge Tubes

Everybody nowadays is familiar with the neon signs used for advertising purposes, but there are probably many who are not familiar with their method of operating; an attempt is made at the exhibition to explain this as simply as possibly. An attractive display of sample tubes illustrates some of their growing uses. The whitish light from a carbon dioxide filled tube is a very fair approximation of daylight, and such tubes worked into compact units are used for colour matching.

Communications

This section represents a very large field of application, and contains many interesting exhibits of telegraph, telephone and wireless apparatus, including the largest thermionic valve yet made (see p. 470). A large amount of apparatus is in operation, and some of Marconi's original apparatus is also displayed. Manual and automatic telephone exchanges can be seen working, demonstrations show how speech is scrambled for transmission over the radio-telephone, and its re-arrangement at the receiver, thus ensuring secrecy of transmission.

There is also a model of a beam transmission system, and some of the plant for the Scottish regional broadcasting station is on view. The exhibitors in this section are the Post Office Engineering Department, British Broadcasting Corporation, Radio Manufacturers' Association, Imperial and International Communications, Ltd., High Conductivity Copper Association, and the Telephone Development Association.

The British Institute of Radiology also contributes to this section some of the latest developments of X-rays and means of their application.

Other Exhibitors

The Cable Makers' Association's stand is representative of transmission and distribution. The Institute of Transport displays applications of electric power to traction by models of railways, road vehicles, and ships, while electric road and railway signalling is depicted.

The Electric Lamp Manufacturers' Association illustrates the utilisation of power in industry by means of intricate electrically-driven machinery which is actually manufacturing electric lamps. This is the first time this process has been shown in public. The automatic lamp-making machines are not of the type now used, but they illustrate the processes involved.

Faraday Commemoration at Liverpool

A luncheon was given on Monday last, prior to the opening of the Faraday Exhibition, in the Preston Hall, Liverpool, the first building in the town to be lighted by electricity (in 1878). The principal speaker was Prof. E. W. Marchant, D.Sc., who referred to Faraday's connection with the North of England, his grandfather, John Faraday, having lived at Clapham Wood Hall, near Clapham, in Yorkshire, only a few miles from the Lancashire border. Faraday's mother, *née* Margaret Hastwell, was the daughter of a farmer of Mallerstang, near Kirkby Stephen, in Westmorland.

The exhibition, like that in London, is in no sense a trade show, but stands are arranged, with old and new apparatus, to show clearly the line of development. The exhibits were collected by a joint committee of the I.E.E., Mersey and North Wales Centre, the B.E.D.A., and representatives of the principal manufacturers in South-West Lancashire and Cheshire, Liverpool University, the Museum, and the Municipal Electricity Department.

Among the exhibits are a Swinburne "hedgehog" transformer, old and new two-pole motors shown in contrast, a Gramme motor of 1878, a motor used by Sir Oliver Lodge in his early experiments (about 1895), a dynamo used for lighting the street arc lamps in Liverpool in 1880, a Gramme dynamo presented to Liverpool University by Sir Joseph Swan, and an early Wimshurst machine.

Among the modern "light-current" engineering exhibits are such recent developments as automatic telephones, a short-wave transmitter, a television set, and a talking-picture projector. There is also a range of radio valves from 1904 to date, including a 10-kW transmitting valve with dissipation at the anode. Another series of valves dates from Professor Fleming's original two-electrode valve to a water-cooled valve capable of rectifying over 100 h.p.

Other examples of modern products include cables, spot and butt welders, signs, lamps, and cooking apparatus.

The British Association

A Hundred Years' Activity

[*The Centenary Meeting of the British Association for the Advancement of Science coincides with the Faraday celebrations and has naturally been closely linked with them. The meeting opened on Wednesday evening, when Gen. the Rt. Hon. J. C. Smuts delivered his presidential address which we review on this page.*]

THE fourteen sections into which the activities of the Association are divided are holding their meetings in various South Kensington buildings. Sections G—Engineering and F—Economics meet in the City and Guilds Engineering College, and Sections A—Mathematical and Physical Sciences and B—Chemistry in the main building of the Imperial College of Science and Technology.

There was a very distinguished gathering at the Albert Hall on Wednesday afternoon when Prof. F. O. Bower handed over the office of President to General the Rt. Hon. J. C. Smuts, who welcomed the delegates from associated bodies. The presidential address was delivered at the Central Hall, Westminster, the same evening.

The sections commenced their business early on Thursday morning. In accordance with the practice established a few years ago, the addresses of the Sectional Presidents are being delivered on various days throughout the meeting.

Two such addresses were presented yesterday. Sir J. J. Thomson, O.M., President of Section A, took as his subject, "The Growth in Opportunities of Education and Research in Physics in the past Fifty Years," and the title of the address of the President of Section B (Brig.-Gen. Sir Harold Hartley) was "Michael Faraday and the Theory of Electrolytic Conduction." We briefly review both of these addresses.

Sir Alfred Ewing, K.C.B., the President of the Engineering Section, is to deliver his address on "Power" this (Friday) afternoon.

Yesterday's proceedings in the Engineering Section were opened by Sir Robert Hadfield, Bt., who presented the results and tests on 79 specimens of Faraday's steels and alloys. The facts disclosed are claimed to prove that Faraday is entitled to be regarded as a metallurgical investigator of the highest ability and the pioneer of alloy steels. Dr. W. Rosenhain and Professor F. C. Lea also presented papers dealing with metallurgical subjects.

To-day's proceedings commence with a paper on "Acoustical Problems and Broadcasting Studios," by Mr. N. Ashbridge, the chief engineer of the B.B.C.

Among the papers of interest to electrical engineers included in next week's proceedings are: "Engineers' Contributions to Canada's Development," by Brig.-Gen. C. H. Mitchell; "Pioneering in Electrical Engineering Half a Century Ago," by Professor Elihu Thomson; and "Spark-Neglecting Commutation: A New Principle in Large-Power D.C. Production," by Professor Julius Hartmann.

In addition to these, there are papers dealing with current problems in the Economics Section, several of them relating to industrial matters. To-day in Section A there is to be a discussion on "Geo-physical Methods of Prospecting, with special reference to Instruments," in the course of which Mr. Karl Sundberg will deal with electrical methods and Mr. A. B. Broughton Edge will describe some recent developments in electrical prospecting instruments.

The Presidential Address

In his presidential address General the Rt. Hon. J. C. Smuts, P.C., C.H., F.R.S., presented a scientific world picture of to-day resulting from the advances of physical, biological, and mental science during the hundred years covered roughly by the activities of the Association. Science, he said, arose from ordinary experience and commonsense outlook, giving a mechanistic view of life, into which it has been difficult to fit entities like life and mind. In the 20th century physical science ceased to confine itself to things apparent to the senses; radiations, protons and electrons emerged as elements which underlie and form our world of matter; matter itself practically disappeared into electrical energy.

The physical concept of space-time has made it possible to construe matter, mass, and energy as but definite measurable conditions of curvature in the structure of space-time. Further modification will probably be necessary by incorporating the additional element of direction.

The quantum theory (according to which energy consists of discrete grains or quanta) introduces an apparent contradiction of reason, as the quantum appears to behave like a particle out of space or time, but our hopes are founded on the working out of a new system of concepts and laws; the recent rapid developments of wave mechanics seem to have brought us within sight of this ideal. The quantum offers a suggestive analogy to life. It behaves as an indivisible whole as life does.

The gulf between inorganic matter and life is being bridged. Stuff-like entities have disappeared and have been replaced by space-time configurations whose nature depends upon organisation, or "holism," a principle that pervades the organic structures of life. So far from biology being forced into a physical mould, physics will look to biology, and even to psychology for suggestions.

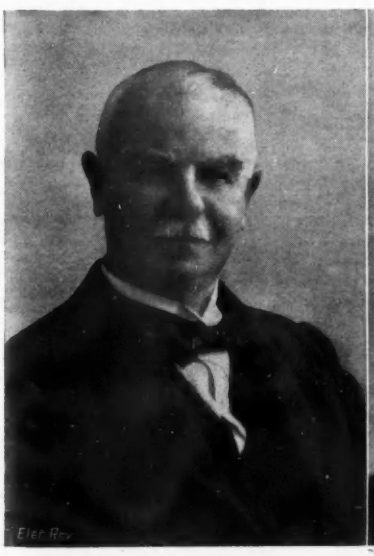
Thus matter is fundamentally an organisation of space-time, and life an organisation of space-time patterns into organic unities. Mind is an even more potent embodiment of the organising principle and its highest reach is seen in the realms of values.

From the view-point of physics, life and mind are exceptional phenomena off the main track of the universe. Even if life be, however, merely a terrestrial phenomenon it is not in an alien environment if this is an essentially organic universe. So far from the cosmic status of life and mind being degraded by the newer astronomy and physics, it may be said that we are in the emergence of life and mind witnessing the birth or revelation of a new world out of the macroscopic physical universe—perhaps the grandest event in the history of our universe.

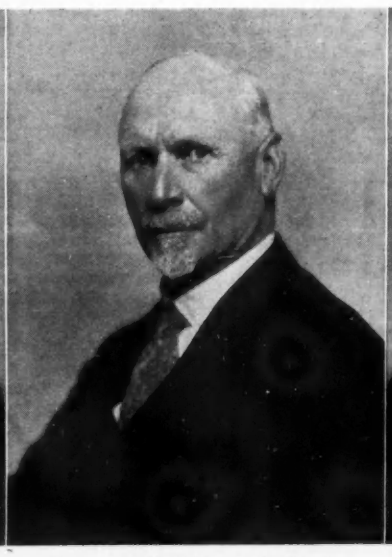
The world picture is fuller of mystery than ever. Materialism has practically disappeared and the universe, in ever varying degree, is holistic through and through.

The universe appears to have attained to its perfection of organisation in the far distant past and to be regressing to simpler forms, which provide the opportunity for the emergence of the more advanced vital and rational patterns.

At the conclusion of his brilliant survey of scientific tendencies, General Smuts reminded his listeners that the world consists not only of electrons and radiations, but also of souls and aspirations.



Sir J. Alfred Ewing



Gen. the Rt. Hon. J. C. Smuts

Sir J. J. Thomson, O.M.

Photographs by Elliott & Fry, Ltd.

Faraday and Electrolytic Conduction

The address of the president of Section B—Chemistry—related to Michael Faraday and the law of electrolytic conduction. Sir Harold Hartley, C.B.E., M.C., F.R.S., referred to Faraday's early training as a chemist and also to his material success as a consulting chemist until 1831 when he deliberately gave up his practice in order to devote himself to research.

Brig.-Gen. Sir H. Hartley, President of Section B
Photograph by Elliott & Fry

His discovery of magneto-electricity raised afresh in Faraday's mind the problems of the identity of electricities from various sources, and chemical action was one of the tests he applied to its solution. He established in 1832 that common (frictional) and voltaic electricity were identical by showing that such quantities of the two kinds of electricity as produced equal effects on his galvanometer also liberated equal amounts of iodine.

In 1833 Faraday found that the same amount of current liberated the same volume of gas, irrespective of the concentration of the acid, the size of the electrodes, or current density. In January, 1834, Faraday made his most important contribution to electro-chemistry in a paper communicated to the Royal Society. It contained his first and second laws of electrolysis and introduced the terminology which we still use.

During the century that has elapsed since Faraday's discoveries the conduction of electricity in solutions has remained one of the central problems of chemistry and physics. The chief landmarks in the development of the ionic theory have been: (1) the discovery of the general relationships between the conductivity of solutions and the concentration and nature of the dissolved substances; (2) the recognition of their relations to the general theories of chemistry; and (3) the quantitative explanation of the properties of electrolytes.

In 1883 Arrhenius suggested that molecules in active conductivity are also active chemically, and that these active molecules are dissociated. The ionic theory whose value was quickly established in the most varied fields was published in 1887. The reason for ionisation and for the stability of ions remained unknown until the discoveries of Rutherford and Moseley had made possible Bohr's application of the quantum theory to the problem of atomic structure.

The discrepancy between the behaviour of strong electrolytes and the mass law remained until Debye showed that the distribution of the charge in the ionic atmosphere depended on the square root of the concentration. The fundamental idea of the new theory is the existence of an ionic atmosphere with a finite time of formation and dispersion.

The term "ionic association" marks the contrast between the old outlook and the new. It is known now that most salts are already ionised in the crystalline state, and the question is whether the condition of complete ionisation persists on solution of the crystal.

In recent years the many-sided influence of the solvent has become more and more prominent. By its dielectric constant the solvent determines the magnitude of the inter-ionic forces; by its power of solvating the ions it exerts a decisive influence on the extent to which they form ion pairs or undissociated molecules; and by its viscosity, as well as by the extent of solvation, it determines the mobilities of the ions. The task of the immediate future is to discover the precise nature and extent of the solvent atmosphere around the ions.

Research in Physics

The growth of opportunities for education and research in physics during the past fifty years formed the subject of the address given by Sir J. J. Thomson, O.M., F.R.S., as president of Section A—Mathematical and Physical Sciences. The facilities for research at the present time were contrasted with those available towards the end of last century. Now the number of physical laboratories at training centres is upwards of 300 as against six in the early seventies.

Science even yet does not occupy a place in our systems of education commensurate with its ever increasing influence on human thought, and the training afforded by natural science will be incomplete unless the student undertakes some piece of research. In a university laboratory the most important thing is to produce well-trained men, wherein it differs from commercial laboratories.

The only careers open to those trained in research work sixty years ago were as teachers in the few physical laboratories in existence, but at the beginning of this century the importance of research in industry began to be realised, and in 1901 the National Physical Laboratory was formed for research in pure science and in subjects of immediate industrial application. Large firms have their own laboratories to investigate their special problems, but the cost is beyond the reach of most concerns. To extend the benefits of research to industry generally, the Department of Scientific and Industrial Research was formed by the Government in 1915; this has instigated and made grants for the formation, by various industries, of some twenty research associations, with suitably equipped laboratories, and there is good reason to believe that the financial gain to industry has far exceeded the expense. The Department has established research boards, such as those for fuel and radio, with fully equipped laboratories. It has also made grants to students during the last ten years of £228,970, the average number receiving grants each year being 184.

The demand in Cambridge for workers trained in research has, until this year of acute depression, exceeded the supply. The increase in the number of such workers has led to a corresponding increase in the number of papers on physics, of which no one can read more than a small fraction. Some equivalent is needed in physics to the annual reports issued by the Chemical Society.

The instruments used in laboratories are now very much better than they were fifty years ago. Thus, a modern suitably selected galvanometer may be at least ten thousand times more efficient than any then available. An increase in the efficiency of an instrument may open up a new region of physical phenomena. Roughly speaking, modern physics depends upon our power of studying individual atoms and electrons. One atom must not be hit by another while under observation; there would be 10,000 collisions per centimetre at atmospheric pressure. The production of high vacua by means of charcoal cooled by liquid air has enabled experiments to be carried out that have revolutionised our ideas of the structure of matter.

As science helps industry, so industry helps science, an illustration of this being found in the fact that the need of a high vacuum for hot-wire valves and lamps made its production a matter of commercial importance, with the result that the physicist has now at his command pumps so powerful that they can maintain a very high vacuum in spite of the influx of the particles to be studied. The hot-wire valve produces immense magnification of weak effects and enables the detection with certainty of phenomena formerly beyond our ken.

Manchester's Faraday Commemoration

A CONVERSAZIONE, organised by the Institution of Electrical Engineers, and held on Monday night, at the Manchester University, proved an unqualified success. A gathering of nearly 800 was received by the Lord Mayor of Manchester (Alderman Titt) and the Lady Mayoress. Many figures prominent in the electrical world from Manchester and about Lancashire were present, including many representatives of power authorities, electrical engineers, and well-known contractors.

The broadcast of the London Commemorative Meeting was received in the Whitworth Hall, and the speeches of the Prime Minister and Sir William Bragg were heard as distinctly as if the speakers had been present. The new talking film, "Michael Faraday," in which Sir William Bragg gives a brief account of the life of Faraday, and an idea of the far-reaching effects of his discoveries, was appreciated alike by the technical experts and their wives and friends. Some very fine demonstrations were given in the physics laboratories, and these certainly caused a good deal of amusement amongst the non-technical members of the party, and at the same time succeeded in their object of bringing home to every one present the fundamental importance of Faraday's work to modern civilisation. The visitors were first shown replicas of the actual apparatus with which Faraday discovered the relation between electricity and magnetism, and the spinning egg and the "Faraday" jumping ring were demonstrated.

The experiments and demonstrations which followed showed the evolution of Faraday's ideas. The ladies present were particularly fascinated by the electron bombardment demonstrations on account of the beautiful colourings. This demonstration also included the production of X-rays. The well-known "lead tree" was also demonstrated by means of a projecting lantern. Electrical refraction by means of a Tesla coil also attracted attention. The wireless enthusiasts were naturally interested in a demonstration of short-wave transmission which was carried out on a wavelength of 5 metres. The evening was brought to a pleasant conclusion with a dance.

The floodlighting of the Manchester Town Hall, which is taking place each night this week, is being carried out by means of a battery of seventy projectors, and large crowds were attracted on the opening night. In Stockport the Town Hall and the War Memorial were floodlighted, and very beautiful effects were obtained by floodlighting the River Mersey. The Stockport Corporation also ran an illuminated tramcar through the town. Bramhall Hall, an Elizabethan mansion near Stockport, which is built in half-timbered style, looked very picturesque under the brilliance of floodlights.

Radio Apparatus for 1932

Personal Impressions of This Year's National Exhibition at Olympia *

By P. K. TURNER, M.I.E.E.

A YEAR ago I got into trouble; I gave my impressions of the 1930 radio show, and they made nothing like such flattering reading as the uniform stand-to-stand reports which are the regulation thing. Rather to my surprise (after what some of the exhibitors said to me after the show) I have been asked to do it again, and this time I am pleased to have found better progress, in some respects at any rate.

Receiving Sets

Considering first the complete receivers, one thing stands out at once—more care in making them good to look at and easy to work. Calibration, either in wave-lengths or even by names of stations, is becoming common, and special devices to avoid confusion have been introduced, such as allowing only one scale to appear (the operation of the wave-range switch changing it), or the equivalent arrangement on the "Ekco" set, where the tuning knob also does wave-range and gramophone switching and indicates quite unmistakably what is being done. There is also a distinct improvement in production design. Coupled with a surprising reduction in prices this would seem to indicate that many manufacturers are having sufficient confidence to lay down respectable quantities, though I fear the limitations of territory and market will always keep us behind the Americans in this respect. I don't see any British manufacturers tooling for a production of 100,000 sets, just yet at any rate, and they cannot be blamed for this.

I am glad also to see that the "portable" of the ordinary type is not so prominent as last year, though there are still too many of them for my taste. Several makers of good repute have made excellent bids for a share of that market, which must always exist, for sets at the very minimum of cost; previously, very cheap sets have almost always been trash, but there are now some, at any rate, which give fair value for their very low cost.

Coming now to the design of the sets exhibited, quite a lot of progress is indicated on the radio-frequency side. There are many sets with "band-pass filters" designed to avoid excessive high-note loss, and in the majority of cases where there are several condensers these are "ganged" for control by one knob. Also, the supersonic type of set is coming into its own again. I am, in fact, pleasantly surprised at the quickness with which some manufacturers have seized on its obvious advantage: that since the "intermediate" amplifier of a supersonic set works at one definite frequency, it can be designed to give just the right side-band width, whereas it is quite difficult to maintain this condition in an ordinary radio-frequency amplifier all over its tuning range.

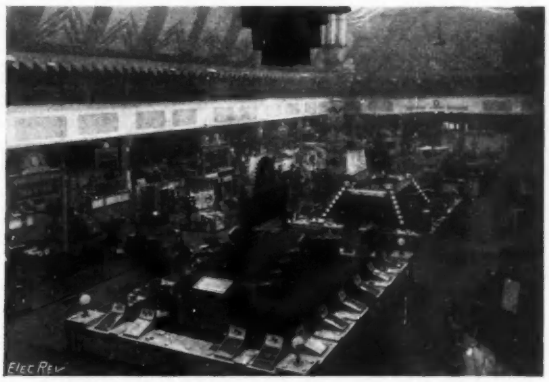
At the same time, each of the two detectors in a supersonic set presents a special problem, and the second, especially, a rather difficult one. Any detector is liable to give diminished output at high modulation frequencies, and the difficulty increases with the radio wave-length. The falling-off increases as the ratio of radio to modulation frequency gets smaller. In the supersonic, the "radio" wavelength at the second detector is two or three times that of the longest actual radio wave to be received, and more care is needed. I am inclined to think that this point has not received enough attention in some cases.

Audio-frequency Design

With the audio-frequency design I was frankly disappointed. True, I must admit that the really atrocious audio amplifier with two bad transformers has almost died out, and that there is the beginning of an understanding of how good rectifiers should be used; but the cheaper and simpler receivers—and many of the expensive ones too—are still not what they might be. It is a curious point that radio-gramophones usually have better audio amplifiers than the plain radio receivers of the same class. Why is this, I wonder? Is it that that part of the public which wants and can afford a first-class set always insists on being able to play off records? In any case, it is rather illogical, for to get the best out of modern radio transmissions calls for a better amplifier than do gramophone records, owing to the wider frequency range. There are comparatively few sets, even among the high-priced ones, which appeared likely to pass the simple test of a good audio amplifier—that a good radio programme (*e.g.*, a promenade concert from London Regional) should be perceptibly more life-like than a record.

Generally speaking, manufacturers still seem to be hypnotised by the pentode. I have nothing to say against the pentode

* September 18th to 26th.



in its proper place—it does things no other valve can do—but its proper place is *not* in a medium-priced set. When it is absolutely essential to keep down the anode-current consumption, and distortion is going to occur anyhow, then the pentode is useful, for it gives a just-bearable result with less current than anything else. And when one wishes to use a moving coil speaker deliberately designed for constant-current operation, this can be done admirably by using a high-power pentode and a carefully designed transformer. But for a medium-powered set, sold for use with any speaker—which will in most cases be a moving-iron one of unknown and variable impedance designed for more or less constant-voltage operation—the pentode is demonstrably wrong.

Another weak point of most sets shown is insufficient output power. Admittedly, a big last stage costs money, and therefore cannot be provided in a cheap set; but when a mains-driven set is held out as a *de luxe* type, giving "perfect reproduction," one is entitled to expect a proper output stage; and I only saw one set that had a last stage of 25 watts dissipation, which is about the right figure.

Valves

Now turning from sets to their two essential adjuncts, I must again congratulate the valve makers, who continue to progress rapidly. This year they offer us the "variable-mu" screened valve, which allows of a really effective radio-frequency volume control (or rather *range*-control), so that a high-power set may receive distant programmes without getting into serious difficulty with near stations, as has been the case in the past. There is also an all-round increase in the "goodness" or mutual conductivity. A few years ago six-volt valves were the best, and offered a "goodness" of barely 1 mA per grid volt. Now 2-V valves of a quarter the filament wattage have conductivities of 1.5 or more, and 2-V power valves go up to 3.5 or so, while mains valves average 3 for medium-impedance types and 5 for power types.

A whole new series of valves has been produced for d.c. mains, with indirect heating at high voltage and low current, and cathodes so well insulated from the heaters that the latter can all be run in series and so take quite a low wattage from the mains. High-power valves have been much improved, and there is a 20-watt pentode—altogether a very fine record of achievement. Just two points need attention: first, in the rush to get better conductivity there is a tendency to increased curvature in the working part of the valve curve—I fear this is unavoidable—but it is worth watching; secondly, valve nomenclature is all at sea again. Years ago I complained of this, and proposed a systematic naming which was adopted by most makers; the "P.220," "L.610," and so on, are examples of it, and it was adequate for its time. But trouble has arisen, for the makers found it possible to improve their valves without change of filament watts, so that, for example, the 1931 "L.210" was a different valve from—and a much better one than—the 1930 one, so to distinguish it they had to depart from the systematic name. Now we have one maker's P.220 corresponding to another's PM.2a, or a DO.24 to one which is practically the same as the PP5/400 (what a name!) from another. We know that the valve-makers work in pretty close touch with one another on some matters; surely they can also get together on this?

Loud Speakers

The other "essential adjunct" is, of course, the loud-speaker. Here, I regret to say, I see no technical progress whatever. The only noticeable point is the entry on the market of many moving-coil speakers of astonishingly low price. The "inductor dynamic" type of moving-iron speaker is now being offered by several makers, but without any important change in design, and balanced-armature speakers seem now more plentiful than the simple reed type, but there seems nothing new.

Last year I was bold enough to say that the moving-coil speakers offered had several serious defects, and that these were to be expected from the glaring and obvious faults in design. And I'm sorry to have to repeat it word-for-word this year. These faults are: bad distortion on low frequencies, below 80 or 100 cycles; severe resonance at some particular low frequency, giving "boom"; severe resonance at some fairly high frequency, usually about 3,000 to 4,000 cycles; and serious falling-off on higher frequencies above, say, 5,000 cycles. I found all four faults simultaneously in some speakers, and I did not hear a single one that was free from all of them (though there may be some such speakers which I missed hearing). Yet all these faults can be overcome, and without prohibitive expense. For two or three years now the loud-speaker has been the worst part of the receiving equipment. Perhaps it always will be, for it is a difficult problem; but even with present knowledge it might be much improved.

Components

As regards radio-frequency components, an increasing feature in the trade is the influence of the semi-technical press on design. The sets which these journals design for their readers are getting more complex, and call for special components, which various manufacturers arrange to supply. On several stands quite a large proportion of the total exhibits were of this kind, designed by the staff of a journal, and not by their makers. Provided that this practice involves collaboration and the pooling of knowledge, it is all to the good; but it is to be hoped that it will not lead to any slackening of activity on the part of the manufacturers' own staffs.

The design of components is on the whole very good—as indeed it was last year—and it is especially notable that the proportion of really trashy stuff is now quite small. There is a considerable increase in the number of gramophone accessories, such as electric motors and pick-ups.

Summary

Summarised, my personal impressions are:—

Sets: More attractive, cheaper, and easier to handle, better radio-frequency arrangements and detection; no improvement in audio-frequency design.

Valves: Steady and rapid improvement.

Loud-speakers: No progress, but reductions in price.

Components: Good and varied assortment.

General: Some very striking examples of stand-dressing.

The Gold Standard Suspended

Opinions of Industrialists

The F.B.I. View

The following statement, reflecting the views of the Federation of British Industries regarding the suspension of the Gold Standard, has been issued by SIR ROLAND NUGENT, its Director:—

"There is nothing in the decision to go off gold which need unduly alarm the public. Fundamentally, the position of the country is as sound as ever. It should be realised that there is no similarity between abandoning the Gold Standard as the result of an abnormal international situation, but with a balanced budget, good stocks of raw materials and food, fully equipped industry, and large assets all over the world, and the immediate post-War position in countries such as Germany, where inflation resulted from a complete exhaustion of all internal resources, the absence of foreign assets, and a hopelessly unbalanced Budget.

"In our present position, if every man keeps his head and carries on with his job, any readjustments there may be will come gradually, and in all human probability with so little inconvenience or loss to the ordinary individual that he will scarcely notice that anything has happened. All that is required is the general steadiness, commonsense and unity which the country has always hitherto shown in difficult circumstances. There is even a definitely encouraging aspect in the events of the last few days in that they must have immensely increased the probability of concerted international action to remedy the world's troubles. Once again Great Britain has been given an opportunity to save herself by her exertions and the world by her example."

Higher Prices for Imports

In the course of a broadcast speech, MR. SNOWDEN, the Chancellor of the Exchequer, said that the result of the Gold Standard (Amendment) Act would be that we should have to pay more for things that we bought from abroad. Imported foodstuffs and raw materials entered so largely into the articles that we consumed that we must expect to see over the next few months some rise in the cost of imported goods. But the rise was not likely to be very large. So far as the great mass of people were concerned, that really was the worst that we had now to fear.

A B.E.A.M.A. Statement in 1926

It will be of interest to quote the following extract from COLONEL R. K. MORCOM'S speech as Chairman of the Council of the B.E.A.M.A., in March, 1926 (ELECTRICAL REVIEW, March 26th, 1926, p. 493):—

"No résumé of 1925 could be complete without some reference to the effects of the return to the Gold Standard. The Prince of Wales, at the Industries Fair, called the export trade the lifebreath of the nation. The re-establishment of the currency rather winded us. Many traders in export business felt that the step was taken prematurely, and that it would have been better to wait till trade recovery had progressed further before taking it. Its effect, in making us a great buying country, was manifest in our remarkable import figure of 1,375 millions. . . . But the expected adjustments in the world's markets lagged sadly behind expectation, and he thought it was beyond dispute that through this lag the return to the gold standard was the last straw that broke the back of the coal industry, emphasised the crisis in steel and textiles, and, in fact, largely accounted for the disappointments of 1925.

"On the other hand, if the advantages promised by the advocates of this important financial operation had been slow to materialise, the difficulties prophesied by its opponents had certainly fallen short of their gloomy prognostications. The financial prophet was notorious for missing the mark. . . . But prophecy apart, he thought they must all believe in the ultimate triumph of financial certitude and honesty. 'We who are prepared to face the inevitable initial difficulties of standardising frequency are not the ones to cavil at the efforts of our financial leaders to standardise their own units.'"

Sir Max Muspratt's Views

SIR MAX MUSPRATT, a director of Imperial Chemical Industries and other industrial companies, asked by the *Financial Times* to give his views, said that the position was too complicated to express any opinion at the moment. If the Gold Standard had to be suspended it was wise to do it at once. Large imports of foreign pig-iron and heavy steel had been coming to Tees-side for some time, and the cheapening of the pound would tend to increase the price of these imported materials, while lowering the price of British iron and steel in terms of foreign currencies. It was also regarded as probable that the suspension of the Gold Standard would assist British shipbuilders in quoting on more favourable terms for tonnage for foreign owners.

A Triple-spectrum Discharge Tube

The possibilities of the electrodeless discharge, as an inexpensive substitute for the mercury-vapour lamp as a light source for spectroscopic, optic, and general instruction laboratories, are considered in *Science* and the results obtained recorded.

A pyrex glass tube about 20 cm. long and 4 cm. in diameter was provided with a side tube B and a "sucked-in" thin glass end. Ten grammes each of zinc, cadmium and mercury were placed in the tube, which was placed in an oven and baked at 450 deg. C. for several hours, while the gases were removed by a mercury diffusion pump.

The completed tube was mounted in an asbestos box equipped with two "Glo-coils," and a helix of copper wire was placed around it. The helix was connected in series with a variable spark gap and the secondary of a 1 kVA Thordorson transformer. Three Leyden jars were connected in parallel with the helix. The variable spark gap, which was enclosed in a sound-proof box, is essential to obtain a discharge which fills the entire tube. In order to prevent the mercury from depositing on the pyrex tube while the tube is in operation, the helix should extend well to the end of the tube. Best results are obtained if large-sized wire is used for all electrical connections.

The result is an inexpensive but brilliant light source which transmits the ultra-violet well and which produces lines extending well into the red—facts which make the tube desirable for spectroscopic calibration. The lines are very sharp, since the tube may be operated at low temperatures and the Doppler effect is small.

High-frequency Telephony.

By L. S. Crutch, B.Sc. (Eng.), Grad.I.E.E.

Communication between stations on interconnected networks

COMMUNICATION between two isolated stations connected by a power line does not present any difficulties, but where there are several stations working on a system having different branches, certain arrangements have to be made to ensure adeqate service, such as those indicated in fig. 1. Each of the three interconnected generating stations, A, B, and C, feeds its own local network, but there are also branches, for large bulk-supply consumers, at XX. In order to keep the high-frequency currents from flowing in paths where they will be uselessly dissipated, chokes CH are inserted at different points, for instance in the branches leading to the bulk consumers and at the entry and exit of each station. The object of the latter is to ensure that as far as

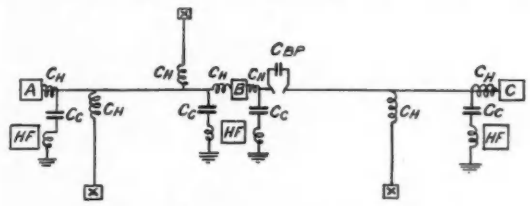


Fig. 1.—A Typical Interconnected System

possible no high-frequency currents flow in the station wiring, so that the service is quite independent of any connections or otherwise which may be made inside the station. These choking coils have an inductance of about 0.1 millihenrys, although this value varies with circumstances. They are made very robust as they have to carry the normal power line current. The construction of coils of this inductance which will safely carry 250 ampères is somewhat expensive, and, furthermore, they have to be mounted on the towers outside the station. The number of such coils required in a small congested area, and the complication due to the different frequencies needed by the various stations, make the high-frequency telephone method of communication uneconomical.

Protection

Adequate protection of the telephone apparatus and the station staff is of fundamental importance in such a method of communication. Normally, the coupling condenser provides the necessary isolation from the lines, but should this break down, spark gaps and fuses graded to operate at certain voltages are provided in all vital parts. Furthermore, there is insulation between the tuning coil joined to the coupling condenser and the remainder of the receiving apparatus, which will withstand 5,000 volts, and a cut-out switch operates to isolate the apparatus before this voltage is exceeded. It is claimed that the present protective system is fully effective under all conditions, and no cases are recorded of its failure or of any injury to either apparatus or personnel. These tests have been carried to the point of deliberately short-circuiting the coupling condenser when the telephone is in use, with entirely satisfactory results.

Communication Systems

It is usual for the receiving apparatus to be permanently connected to the line in order to receive calls at any time. The call may be received either on a loud-speaker, or by a system of lamps or bells operated through relays. The receipt of the call operates a relay which automatically starts up the transmitter in the called station and sends back the calling signal to the station originating the call. The object of this device is to ensure that the call has been received correctly and that the apparatus at each end is functioning. It sometimes happens that the station staff cannot attend immediately to a call, and in such a case the calling station would not know, but for the automatic reply, whether the system was in working order or not.

In cases where there are a number of stations on a system, some method of selective calling is used. This may be either the use of different frequencies for each station or group of stations, or the use of a coded impulse call operating selective receiving mechanism in the called station on the principle of the automatic telephone connection. It is evident that if duplex telephony is to be possible, stations cannot send and receive with the same frequency. In all cases special means are adopted to prevent the transmitter in any station from paralysing its own local receiver, and, with practical attainments of selectivity in the tuning circuits, a frequency separation of at least 20 per cent. is desirable between sending and receiving frequencies. The provision of suitable frequencies for a number of stations and the requirements for conversation between the different stations, together with the total number of conversations which may take place on the system at any one time, constitute a serious problem in apparatus design. Methods whereby the tuning circuits of the receivers are changed automatically cause much complication, and on large networks the problem is usually solved by the adoption of a method known as radial connection. This system is illustrated in fig. 2, which shows the network divided into two areas, each under the control of a central station, marked A and B. The subsidiary stations A_A, A_B, B_A, B_B, etc., only hold communication with one another through the central station, which can itself communicate with any of the subsidiaries at will. All essential communication is carried out, using four different wavelengths, λ_1, λ_2, λ_3, and λ_4. (It is immaterial whether wavelengths or frequencies are used for discussion.) The main station A sends on λ_1, and all the subsidiary stations receive on λ_1, and send on λ_2. Similarly in the B area; the main station B sends on λ_3, and receives on λ_4, whilst all its subsidiaries send on λ_4, and receive on λ_3. Thus two subsidiary stations cannot communicate without passing through the central station, which can retransmit the conversation on its own wavelength. Such a requirement is rarely needed. There is also communication between the main stations A and B on their respective wavelengths, and the re-transmission can be extended to communication between subsidiaries in

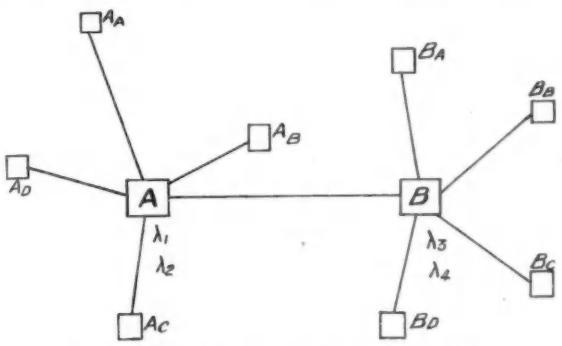


Fig. 2.—Radial Connection of Tuning Circuits

different areas. Experience has shown that this system gives all normally required communication facilities, with a minimum outlay on apparatus and complication of procedure. Connection to the telephone circuit is made by a differential transformer and balancing network. This is, in effect, the 4- to 2-wire termination set as employed in line telephony. The carrier telephone, since sending and receiving takes place

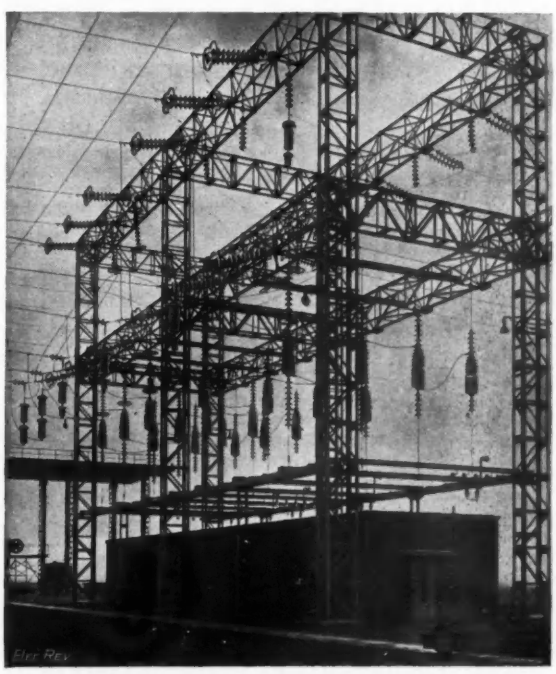


Fig. 3.—Sub-station with Coupling Condensers and Reactors

on different carrier frequencies, is regarded as a 4-wire system, whereas the station telephone set or the local exchange connection is a 2-wire system. Connections to the high-frequency telephone system are not limited to telephones inside the station, and may be extended to local exchanges, over ordinary telephone lines.

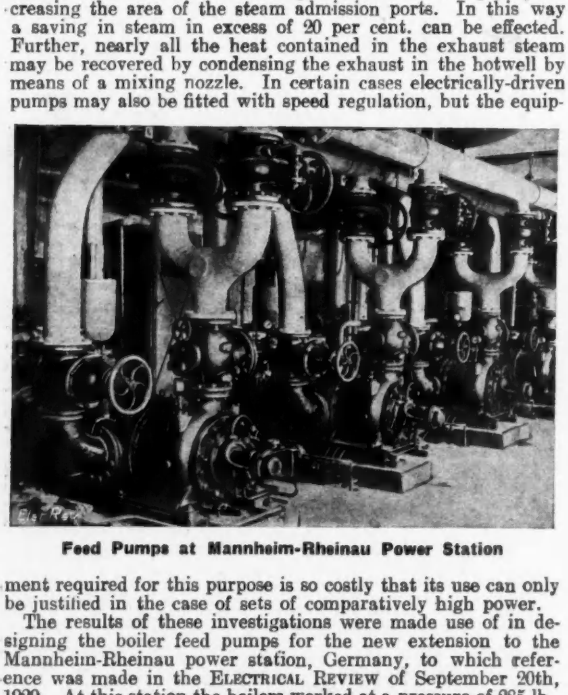
Conclusion

In a brief account it is not possible to deal fully with many interesting aspects of the high-frequency telephone. Its chief advantage lies in its comparative simplicity combined with great reliability. It is not confined to speech transmission, but a description of the impulse-sending systems which are used for the transmission of remote meter readings and other data cannot be given here. If several transmitters and receivers are used, each working on its own frequency, several distinct circuits are possible between stations connected by a single line. One channel may be devoted to speech, one to the transmission of meter readings and remote control, one for typewritten information and instructions by teleprinter telegraph, and, possibly, one for picture transmission. With other systems of line telephony, several lines would be required for most of these channels, and difficulties might arise in the case of picture transmission in providing the necessary frequency band on the circuit. The excellent characteristics of the power lines make all these systems possible with little difficulty, and, moreover, provide a link which requires no extra maintenance charges on the system. These high-frequency telephone systems are extensively used in Germany, the United States, and parts of Europe, but, since lengths of line are shorter in this country, they have not as yet found much application here. The experiences with these systems have been satisfactory from the first, although many changes and improvements have been made from time to time, particularly relating to the coupling methods, signalling equipment, selectivity of the receiver, and the automatic charging of the battery supplies. Maintenance has been mostly confined to routine inspection and testing. In conclusion, the method is simple, and has great possibilities which do not yet seem to be by any means fully explored.

The writer is indebted to the Telefunken Company and Messrs. Siemens Bros. for information contained in this article.

High-capacity Boiler-feed Pumps. By C. H. S. Tupholme

INVESTIGATIONS undertaken with the object of evolving a suitable design of centrifugal boiler-feed pump for hot water and very high pressures have shown that for normal boiler feed service preference should be given to feed pumps fitted with speed regulation. For this purpose pumps driven by steam turbines can be used for working under normal conditions, while electrically-driven constant-speed pumps may be installed as a standby. Further economy in steam may be effected by sub-dividing the turbine nozzle, so that the turbine can be driven at the maximum permissible load simply by increasing the area of the steam admission ports. In this way a saving in steam in excess of 20 per cent. can be effected. Further, nearly all the heat contained in the exhaust steam may be recovered by condensing the exhaust in the hotwell by means of a mixing nozzle. In certain cases electrically-driven pumps may also be fitted with speed regulation, but the equipment required for this purpose is so costly that its use can only be justified in the case of sets of comparatively high power.



Feed Pumps at Mannheim-Rheinau Power Station

The results of these investigations were made use of in designing the boiler feed pumps for the new extension to the Mannheim-Rheinau power station, Germany, to which reference was made in the ELECTRICAL REVIEW of September 20th, 1929. At this station the boilers worked at a pressure of 285 lb., but with the addition of two high-pressure boilers, each evaporating 60 tons of water per hour, the capacity of the station has been increased by 9,500 kW. The boilers are fed by four high-pressure pumps, each of which delivers 90 tons of water per hour, two of them direct-coupled to steam turbines working with steam at 255 lb., and two driven through toothed speed-increasing gearing by three-phase electric motors.

In feeding the boilers the advantages offered by a high feed-water temperature have been made use of. Four four-stage high-lift centrifugal pumps, each delivering 125 tons per hour against a total head of 355 lb., are driven directly by 180-h.p., three-phase motors, 2,900 r.p.m. The condensate is withdrawn by a two-stage pump combined in one pumping set with the cooling-water and injection-water pumps. The condensate, together with the make-up required, is then taken, at a temperature of about 80 deg. C., to the intermediate pumps which deliver the water into a system of constant-pressure heat accumulators in which its temperature is raised almost to the evaporating point. The water then flows at a temperature and pressure of about 200 deg. C. and 265 lb. per sq. in. to the nine-stage high-pressure feed pumps, each of which delivers 90 tons of water per hour and increases the pressure to 1,590 lb. per sq. in.

In the intermediate superheater the exhaust steam from the turbines, at 300 lb./sq. in. and 250 deg. C., has to be brought to a higher degree of superheat (about 340 deg. C.) before it enters the main turbines, and for this purpose live steam at 1,485 lb./sq. in. and 460 deg. C. is passed through the superheater, along the outside of the tubes carrying the steam at 300 lb./sq. in. In consequence of the exchange of heat the temperature of the steam used for heating falls below the critical point, and water by condensation is produced at a temperature of 298 to 306 deg. C., corresponding to a saturation pressure of 1,335 lb. This water is then passed through an auxiliary branch into the super-high-pressure boiler feed pump which it enters at 1,170 lb./sq. in. and 297 deg. C. To reduce the fall in pressure to the minimum this branch is fitted between the sixth and seventh stages of the pump.

When the feed pumps are delivering a small quantity of water, the very hot water thus introduced may cause the temperature in the last stages of the pump and behind the balancing disc to rise considerably. If, for example, the quantity required by the boiler falls to 10 tons per hour, and about 7 tons per hour of condensate constantly enters the pump after the sixth stage, the temperature of the resulting mixture will be about 235 deg. C., corresponding to the saturation pressure at the boundary curve of 430 lb. But the back-pressure on the balancing disc cannot exceed 260 lb., and it is therefore necessary either to cool the water led to the balancing disc, entailing a loss of heat, or, and this is the more practical solution, lead it back to the steam space of the accumulator. In this way all useless complications are avoided and certain and efficient working is at the same time obtained.

Because of the advantages already mentioned, which are given by speed regulation, as compared with regulation by throttling the delivery valve on the pumps, the electrically-driven pumps are also fitted with speed regulation. For this purpose the motors are designed as "Scherbius" machines with frequency convertors, and the regulating apparatus is operated by a governor of the "Ascania" type.

It was not possible to couple the electric motors direct to the pumps, as the latter would then need to have too many stages. On the other hand, the desired effect can only be obtained with pumps with a single casing. For this reason the pumps are driven through spur gearing with a speed ratio of 1,470/4,650 r.p.m.

It is interesting to note that three centrifugal pumps of 3,550 lb. per sq. in. are being installed. One, delivering 60 tons per hour, for the Siemens-Schuckertwerke, Berlin, and the other two, delivering 135 tons of water per hour, for the Centrales Electriques des Flandres et du Brabant, Langerbrugge, Belgium.

Lightning Damage to Underground Cables

It is generally considered that no special protection against lightning is necessary in the case of underground electric cables. In a recent issue of our Austrian contemporary, *Elektrotechnik und Maschinenbau*, however, reference is made to the damage by lightning of the underground telephone cable connecting Switzerland and Austria, and to a cable between Salzburg and Reichenhall. The damage to the cables was of two kinds, resulting either from a discharge between the core of the cable and its sheathing, or the fusion of the cores as a result of the high current density induced in the cable. In the article referred to, Herr M. K. Beiling considers that cables can be protected by laying in the trench about 8 in. above them a stranded iron-wire cable, such a protective lightning conductor having been adopted with good results in connection with the telephone cable of the meteorological station on the summit of the Zug mountain.

Modern Engineering Products

The trend of development is well exemplified at the Shipping, Engineering, and Machinery Exhibition

IT is impracticable to do more than draw our readers' attention to the more outstanding features of an exhibition in which electricity plays so important a part in so many ways. The following notes are a further selection from among the items of interest to be seen at Olympia.

The display made by SIEMENS BROS. & Co., LTD., is one that well depicts their ability to meet the varying electrical requirements of ships, including as it does, ship's telegraphs operated independently of the ordinary electric mains of the vessel, helm, "look-out," and navigation light indicators and marine telephones. Another section of the stand is devoted to wireless equipment, this comprising a complete quenched-spark station—transmitter, receiver and motor alternator—mounted in a cabin, wireless direction finders, etc. Automatic telephone exchange equipments for ship's use, embodying 10, 25, and 50 lines, in conjunction with which a new high-efficiency telephone, known as the "Neophone," is used, are also displayed, as well as "Zed" fuse equipment, distribution boxes and boards, watertight switchplug boxes, and marine flood-lights, with 150/250 watt lamps of either the standard gas-filled or projector type. Finally, reference may be made to the 500-watt single-heat blade-type, and 1,000-watt three-heat tubular immersion heaters for fitting to hot-water tanks which are shown.

That the stand of the BRITISH THOMSON-HOUSTON CO., LTD., is an extremely varied one, may be gathered from the fact that it has been arranged with the idea of demonstrating the multifarious activities of the company in the way not only of supplying ship propulsion and auxiliary machinery, but also every class of electrical equipment used aboard ship in these modern days. So numerous indeed are the exhibits that only a brief reference can be made to the more important. Thus, an example is shown of the main propulsion contactors used on steamers propelled by means of turbo alternators. The apparatus which, among others, has been adopted on the latest P. & O. 14,000-ton steamers, is of the air-break type, controlled by one lever for both normal and emergency operation. The B.T.-H. Co. has devoted special attention to the design and construction of silent-running electric motors, the exhibit comprising 6 and 12 h.p. d.c. machines, supplied either with sleeve-, ball- or roller-bearings, and also with an improved form of brush holder. Attention may also be drawn to a 12 h.p. vertical-spindle motor driving a Drysdale pump, the motor being of deluge-proof construction with separately housed ball-bearings and duplex thrust bearing. Other B.T.-H. exhibits, which can only be mentioned by name, include drum and face-plate type motor starters, squirrel-cage induction motors, electric tachometers, sound amplifying equipment for use in connection with radio, magnetos, Mazda electric lamps, and Ediswan and Harcourt ship-lighting fittings.

A varied and interesting display is that of LAURENCE-SCOTT and ELECTROMOTORS, LTD., comprising as it does 3- and 5-ton electrically operated winches with self-contained contactor-type control gear, the Donkin-Scott electric hand-assisted steering gear for small ships, and electric motors of various types and sizes, including a 90 h.p. 400 V. a.c. motor, designed to run at 720 r.p.m. Prominence is also being given to the two standard sizes—150 and 300 amps.—of the Burke-Scott electric arc welding machines, the motor-generator sets of which can be supplied for either d.c. or a.c.

Electric Cables and Accessories

CALLENDER'S CABLE & CONSTRUCTION CO., LTD., in addition to small samples of their wide range of cables for electric power transmission at all pressures, are on this occasion drawing special attention to their "Maranex" ship wiring cable which is available in single, twin or multi-core form and with paper, rubber or cambric insulation. Also shown are samples of "C.A." cable with special composite insulation, "Kalibond" and "Kaleeco" house wiring, "Kalbitum" paint for preventing the deterioration of iron and steel work, etc. So varied is the display of W. T. HENLEY'S TELEGRAPH WORKS, LTD., that it must suffice on this occasion to state that it is representative of the company's diverse productions. The exhibits, indeed, range from a sample of an 132 kV oil-filled cable down to a new electric soldering iron, with, in between, examples of the Henley and Nomet wiring systems, electric wires of every description and for every purpose, ironclad service cut-outs, joint boxes, switch panels, distributing pillars, and jointing materials. A model is also shown of the Henley patent straight-through lead press, recently described in these columns.

An interesting display of specimens of the cable and other products of the various firms comprised in the group is made at the stand of the CABLE MAKERS' ASSOCIATION, a special feature being made of super-voltage cables for high-pressure distribution. A series of panels also depict various methods of internal wiring by rubber-insulated cables in tubing by metal-covered twin wires by C.T.S. tough rubber-protected cables. Examples of rubber, ebonite and other electrical accessories are shown at the stand of the INDIA RUBBER, GUTTA PERCHA & TELEGRAPH WORKS CO., LTD., together with wet and dry batteries in various sizes.

Electric Cooking Equipment

THE CARRON COMPANY occupies a large stand, on which are shown numerous examples of its productions in the way of ships' cooking appliances, notable among which are two-oven ranges, baking ovens and plates, grillers, fish fryers, and hot closets, all of which embody the latest practice in electric cooking equipment. The two-oven range shown below has the oven elements fitted at the sides, controlled by three-heat rotary indicating switches. On the top are two large and four medium boiling sections, the total electrical load

Large Electric Galley Range

capacity being 26 kW. The range is readily controlled, the switches, fuses and pilot lamps being all grouped on a sheet-steel panel mounted above the range.

Storage Batteries

Another branch of the electrical industry that is well represented is accumulator manufacture. EDISON STORAGE BATTERY DISTRIBUTORS, LTD., in addition to showing examples of complete Edison nickel alkaline batteries of various capacities, display a board depicting the details of the cells and a small portable searchlight comprising a five-cell battery in steel case and an "Auto-Reelite" projecting lamp with 25 ft. of flex. Among the accumulators is a new "C" type which is stated to have 50 per cent. greater capacity for the same horizontal space than the "A" pattern owing to its increased depth. The new type cell is being supplied in batteries ranging in capacity from 338 to 675 a.h. The feature of the Edison exhibit is the joint display by the three makers, of Greenbat, Yale, and Elwell-Parker industrial electric trucks, of from 1 to 5-ton capacity, all fitted with Edison batteries.

Both lead and nickel-steel accumulators in a variety of sizes are shown at the stand of BRITANNIA BATTERIES, LTD., which is also exhibiting a safety lighting equipment by means of which the lighting in cinemas, hospitals and other places is automatically switched over to a battery in case of failure in the ordinary mains supply. The D. P. BATTERY CO., LTD., is present with a display of "Kathanode" marine-type batteries in sizes ranging from 40 to 8,000 a.h. capacity, the largest representing those used for propulsion purposes in submarines. On the stand is a cell cut in section to show the combination spun-glass and wood or ebonite separators which, while allowing free circulation of the electrolyte, prevent the loss of active material from the positive plates. The D. P. Co. also shows an emergency lighting equipment, comprising battery and switchboard, which automatically comes into operation should a failure occur in the ordinary lighting circuit. Another large accumulator display is that of the CHLORIDE ELECTRICAL STORAGE CO., LTD., which exhibits Exide Ironclad accumulators for naval work, one example representing the largest size, made for submarine propulsion purposes. Attention is also being drawn to the "Keepalite" automatic emergency lighting equipment, a feature of which is the inclusion of a trickle charger in conjunction with the battery to maintain the latter in a fully-charged condition.

BATTERIES, LTD., not only display examples of the "Nife" nickel-cadmium accumulators in all sizes, but in sets specially grouped for various uses, such as yachts and emergency lighting, as also engine starting, a demonstration being given of the small drop in voltage on heavy discharge during the last-mentioned application. One of the great advantages claimed for the batteries is that, being alkaline, there is no chemical action between the plates and the electrolyte, rendering them suitable for use in cases where the work required of them is intermittent, as well as for constant periods of discharge and charge. One interesting application of the "Nife" accumulator is seen in their use for the tripping of h.v. switchgear, as adopted at the Birmingham and Sheffield power stations. In addition to cells, the company displays at its stand a wide range of "Nife" operated handlamps, floodlight sets and portable searchlights.

Electric Welding Equipment

Electric welding plant is to be seen at quite a number of stands. The MUREX WELDING PROCESSES, LTD., which is an amalgamation of the businesses of the Alloy Welding Processes, Ltd., and the Premier Electric Welding Co., Ltd., has on view a large range of equipment suitable for the welding of all metals. Included in the display is an automatic universal profile welding machine, a portable welding transformer, and a compact motor-generator set for one operator, the motor starting panel and generator accessories being mounted as part of the unit. The dynamo is of a special type designed to supply a practically constant current to the arc, without the use of a reactor, the feature being the division of the pole faces into two parts in such a way that the air gap is not uniform over the whole polar arc.

The stand of BRITISH INSULATED CABLES, LTD., is divided into two sections, in one of which specimens are shown of some of the many varieties of electric cables and wires manufactured at the Prescot works, while the other is devoted to a display of two of the firm's latest types of electric welding machines which are shown in operation, viz., an automatic butt welder, notable for the provision of a relay device which cuts out the current when the requisite temperature has been reached, and an automatic spot welding machine. Also to be seen is a three-heat rivet heater for the rapid heating of rivets up to 1 in. diameter. SIEMENS-SCHUCKERT (GREAT BRITAIN), LTD., occupy a large stand, on which are shown so many examples of electrically operated machines and tools that only a brief mention of the more important can be made. Thus attention may be drawn to the numerous types of metallic and carbon arc welding machines in both fixed and portable forms and for spot, butt and seam welding; to the "Elmo" range of portable tools, including drills, grinders and filing machines; and to the electrically operated self-priming centrifugal pumps.

Among the old-established makers of electric welding plant is the QUASI-ARC CO., LTD., which has a working display of its various productions including standard single-operator d.c. motor-generator sets of both fixed and portable types. Samples of "Quasi-Arc" patent electrodes and weld metal are also to be seen on the stand, together with many examples of welded joints made by the "Quasi-Arc" methods.

Air Compressors and Pumps

Compressors for the operation of compressed air auxiliaries for marine and land use are shown in several forms by REAVELL & CO., LTD. Among them is a two-cylinder single-acting machine driven by a 12.4 h.p. 220 V. electric motor for compressing air to a pressure of 100 lb. per sq. in., the outfit being claimed to give a high volumetric effect with low power consumption.

L. G. HAWKINS & CO., LTD., have on view a compact electrically driven paint-spraying plant known as the "All-Purpose Sprayit." It comprises a small air compressor, paint container of a capacity of two gallons, stated to be able to cover a surface of about 700 sq. ft., a spraying gun, and the necessary compressed air and paint hose. Using a motor of only from ¼ to ½ h.p., it is claimed that one man can spread paint over an area of from 1,200 to 2,800 sq. ft. per hour.

The chief exhibit of the PULSOMETER ENGINEERING CO., LTD., takes the form of a 5 in. self-priming pump, designed for marine purposes and capable of delivering 75 tons of water per hour against a total head of 82 ft., or 115 tons per hour at 55 ft. The pump is compactly arranged, and is driven by a 13 b.h.p. vertical-shaft electric motor running at from 1,300 to 1,600 r.p.m. and spigoted on the top of the column. An interesting feature of the design is the provision, in conjunction with the shaft between the motor and the pump, of a small gear box driving, through spiral gearing and a friction clutch, a water-ring exhauster for priming purposes.

Fractional Horse-power Motors

POWER CONTRACTS (BATWIN), LTD., in addition to a range of the Batwin fractional motors of both the single-phase repulsion induction and d.c. types, have on view several examples of the Batwin oscillating mercury tube flashers for use in conjunction with neon-tube signs and electrical advertising displays. The flashers, which are made in a large variety of combinations, are fitted with built-up coils of enamelled copper wire, provision being made for the ready adjustment of the ratio of light and dark periods.

A novel application of fractional horse-power motors is to be seen at the stand of GEORGE KENT, LTD., in the firm's clear view screen. Introduced to provide a clear view on ships in bad weather, it consists of a circular glass panel let into the usual screen, the panel being rotated electrically at a high speed so that any water or mist is centrifugally removed. The idea has, we understand, recently been adopted with success on both tramcars and electric locomotives. Included in the display of the SPERRY GYROSCOPE CO., LTD., are several searchlights, amongst them being a 24-in. incandescent light with split mirror designed for use at night on the Suez Canal, and a 24-in. high-intensity light with remote control, so that no operator is required at the lamp.

Miscellaneous Exhibits

Some interesting examples of the numerous applications of the Fescol process of electro-chemical deposition of metals are to be seen at the stand of FESCOL, LTD. While nickel is the one usually employed, cadmium, chromium, lead, and copper can also be dealt with. Although proper protection against wear, corrosion and erosion is among the main advantages of the process, another important use is that of restoring worn shafts and other parts by deposition to their original dimensions. Thus it is possible, as one example, to recondition worn armature shafts without its being necessary to remove the winding. Fescol-ised electrical contact fingers and sparking plates are also now being largely used by reason of their long wearing qualities.

ROSS, COURTNEY & CO., LTD., who specialise in turned and press metal parts for electrical engineers, display examples of their cable clamps and electrical terminals of all kinds. Efficiency with economy is the claim made for the flexible-arm lamp fittings and standards made by the "TYPERLITE" CO., which shows them in forms suitable for all classes of office and workshop use. The J. P. TUBULAR HEATER CO. shows its electric tubular heater as applied to towel rails, radiators, etc. The feature of the J. P. system is the mounting of the insulators and mica discs supporting the heating element, on a flexible steel spring, the whole being enclosed in a 2¼in. rigid or flexible steel tube. The standard loading is 60 watts per foot, but heaters of from 30 to 100 watts per foot can be supplied.

The RAWLPLUG CO., LTD., in addition to their well-known Rawlplugs and bolt anchors, are showing for the first time a new mechanical hammer by means of which holes for Rawlplugs can be made much more quickly and accurately than is possible by hand. The BRITISH DARDELET THREADLOCK CO., LTD., while making bolts and nuts with B.S.W. and B.S.F. threads, are taking advantage of the Exhibition to demonstrate the Dardelet self-locking screw thread, the profile of which is such that when the nut is screwed home on the bolt, the nut thread is forced up a gentle slope on the bolt thread, so firmly securing it in position. The Dardelet bolts and nuts have been subjected to tensile and vibration tests at the National Physical Laboratory, the results of which are given in a booklet obtainable from the company. Practically the only firm in the Exhibition showing electrical advertising signs is the K.F.M. ENGINEERING CO., LTD., the display including a number of Internalite signs as supplied for use on the *Empress of Britain* and other ships. In addition to pneumatically operated tools in which the air is supplied by electrically driven compressors, the CONSOLIDATED PNEUMATIC TOOL CO., LTD., displays a range of Hicycle portable electric tools, a recent addition to which is a drill, specially designed for shipyard work. Measuring only 15½ in. overall, it is well adapted for use in confined spaces. Attention may also be drawn to the Little Giant portable electric blower made by this firm, which is being largely used for blowing out dust from electrical machinery.

Apparatus for the electrical production of ozone is well displayed by OZONAIR, LTD., the exhibit including a combined heating and ventilating plant, each unit of which is capable of dealing with about 3,000 sq. ft. of floor space. At the other end of the scale is small portable apparatus for air purification in offices and living rooms. The "Ventex" air filter is also to be seen at this stand.

Boiler Explosions in 1930

The report by the Board of Trade upon the working of the Boiler Explosions Acts during 1930 has been published (H.M. Stationery Office, 6d.). The Acts provide for inquiries to be held in regard to explosions from boilers in Great Britain and Northern Ireland, and on board British ships. The term "boiler" is defined to include tubes of steam ovens, heating apparatus, steam pipes, stop-valve chests, steam-heated hot plates, calenders, drying cylinders, economisers, steam-jacketed pans, rag boilers, kiers, and stills. The owner of any boiler in which an explosion occurs must report the fact to the Board of Trade. Boilers used in the Government service and domestic boilers are excluded from the scope of the Acts, and explosions from boilers in railway locomotives are not dealt with by the Board of Trade. Of the fifty-five explosions in 1930, twenty-five resulted in the loss of life or in personal injury, five persons having been killed and twenty-five injured. The five deaths were caused by five explosions, of which four occurred on land and one in a ship; the number of lives lost in 1930 is the smallest in any year since the Boiler Explosions Acts were passed.

Museum Flood-lighting

An outstanding example at Cambridge

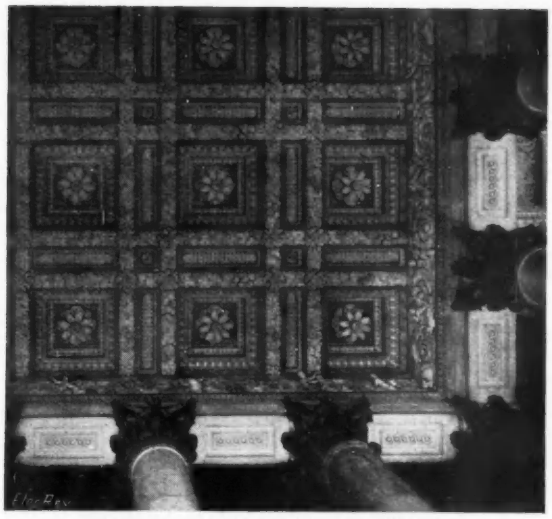
AN obvious desideratum in most modern illumination projects is sympathetic co-ordination of conception and execution. Rarely do two people have the same understanding of any one idea; invariably one-sided experience tends to exercise undue influence by hardening itself into an individual theory concerning something which is not yet thoroughly established as common practice; all variables are consequently forced into line to suit the particular individual view. The layman is no doubt impressed chiefly by novelty, if he notices it at all. It is the visual effect that impresses him, but the engineer, bearing in mind all the canons of his craft and dealing with an abstract problem in a mathematical manner, is often disappointed that his method does not provide comfortable visibility. The intensity may simulate sunlight brightness, but artificial illumination approaching the natural intensity seems extremely bright—glaring, in fact—maybe because, apart from colour differences, the surrounding conditions are not comparable. Blatant floodlighting becomes absolutely flat if designed only from the aspect of even distribution from whatever vantage point seems practical. It is not always appreciated that classical architecture attained to a high degree of perfection by reason of the rhythm, proportion, and suggested progression imparted by the subtle use of high lights, shadows, gradation of shade, and reflected light of the warm brilliant rays of the sun (a unidirectional source) and the cool general light of the sky.

The ordinary individual thinks of light merely as a function of seeing, as a practical means of extending activity when and where daylight fails. He wants visibility, but instinctively appreciates the artistic expression of functionality, and so it was decided in illuminating Cambridge for the plenary session of the International Commission on Illumination this week that the effort should be in keeping with the atmosphere of the old University town in which practically all the college buildings are centuries old.

The Fitzwilliam Museum building is known the world over. It is of classical design, and its illumination called for something more than merely heavy batteries of projectors. The installation was planned and carried out entirely by the Service and Sales Department of the Cambridge Electric Supply Co., Ltd., at its own expense. The G.E.C. lanterns employed are of three types:—

No. F. 5721, of which five were fixed on the roofs of houses opposite for illuminating the pediment. They are so arranged that the light is not central, but produces a certain amount of shadow which throws the figures out in relief and obviates the flat effect of straightforward lighting.

F. 5701, of which seventeen have been used to illuminate the back walls and tympanum, where the majority of the light is concentrated. With these lanterns alone a very good silhouette effect of the columns would have been obtained; the pillars would have stood out absolutely jet black, but, although this would have resulted in a very fine contrast, it would have produced a harsh effect, and none of the detail of the beautiful capitals would have been seen. Therefore, a certain amount of light has been massed on the columns by means of fourteen F. 5727 lanterns.



Ceiling Detail Revealed by Floodlighting

"Osram" lamps are used throughout, of the ordinary standard 1,000-watt type, except in the F. 5721 lanterns, for which "B" projector-type 1,000-watt lamps are employed. The photographs reproduced on this page, all of which we took without the aid of any additional light, portray the excellence of the results obtained, the ceiling detail revealed being remarkable. This installation is a clear demonstration of artistic treatment with a suitably devised scheme.

The Dorothy Café is another building that has been temporarily floodlighted for the same occasion. The lanterns employed are "Holophane" FL. 500E type, six in number, and fitted with 500-watt "Osram" lamps. The building being ultra-modern and constructed of whitish-grey glazed brick, a very pleasing effect is obtained. It was at this café that the directors of the local gas and electricity companies held a reception and gave a dance to the delegates to the Congress.

Since the Cambridge Electric Supply Co., Ltd., became associated with Edmundsons' Electricity Corporation, Ltd., a forward policy has enabled the undertaking to be developed on up-to-date lines.

Fitzwilliam Museum, Cambridge, Floodlighted for the Plenary Meeting of the International Commission on Illumination

A Remarkable Radio Valve

Demountable, 500-kW, continuously-evacuated type for the G.P.O. Transmitter at Rugby

A HIGH-POWER, demountable, continuously-evacuated thermionic transmitting valve is the ideal for which investigators have long striven. The discovery that made the construction of this engineering masterpiece possible in a practical commercial form emanated from the research laboratories of the Metropolitan-Vickers Electrical Company, a subsidiary of Associated Electrical Industries, Ltd., wherein some three years ago experiments in no way connected with wireless valves, and, indeed, not expected to be of any industrial consequence, led to the production of oil distillates having remarkable properties. They could be boiled at a fairly low pressure without decomposition, and yet at room temperature their rate of evaporation was so small that they could be placed inside a valve without impairing its vacuum. Such a material at once appealed to the vacuum physicist as the ideal liquid to replace the mercury of the vapour pump, as, due to its low volatility, cooling could be effected with water, and the cumbersome, expensive liquid-air process eliminated—a vitally important step.

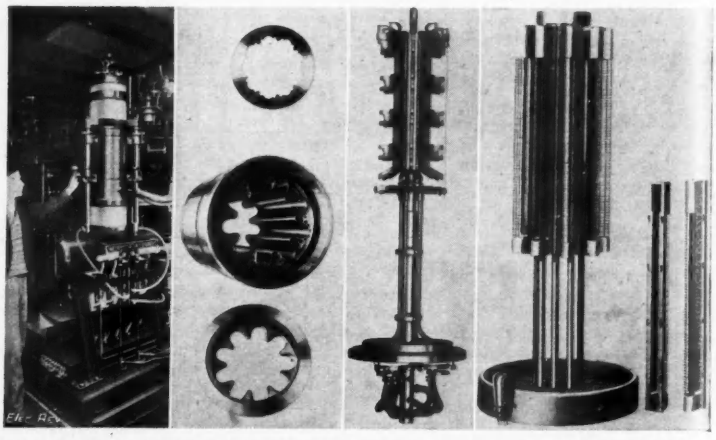
In 1930, a valve designed for an input of approximately 25 kilowatts was constructed, incorporating the new development, and it proved so satisfactory in actual continuous service at the Government's Rugby wireless station that the G.P.O., which had from the early stages shown a lively and progressive interest in the tests, entrusted the Metropolitan-Vickers Company with the design and manufacture of a 500-kilowatt valve. Thus, after overcoming numerous mechanical difficulties, some of the parts, for instance, called for an accuracy in commercial production of the order of one-hundred-thousandth of an inch, an entirely new development conceived less than three years ago has been brought to a successful commercial conclusion.

The new valve stands 10 ft. high, and is 14 in. in diameter. Complete, it weighs over a ton, and is built on a welded-steel bedplate 8 ft. long by 3 ft. wide. Its water-cooled steel anode weighs 3 cwt., and is equipped with hydraulic jacks to facilitate demounting and assembly. Its filament current is approximately 500 amperes, and its filament emission 160 amperes, representing an electron flow of 300,000,000,000,000,000 (three hundred thousand billion) electrons per second. It is capable of operating the main transmitter at Rugby, thereby replacing a bank of 50 valves.

No glass is used in its construction, but a robust combination of steel, porcelain, and copper. As a result of the continuous evacuation, and in sharp contrast with valves of the permanently sealed type, the new type improves with age, any gas evolved during its operation being rapidly removed by the pumps. Thus an exceedingly high vacuum is maintained even at the highest power inputs. The pumps, with the exception of a simple type of primary extractor, have no moving parts, and mechanical trouble is, therefore, a very remote possibility.

Finally, the valve is completely demountable. In the event of filament or other repairs being necessary it may be rapidly taken to pieces, the repairs executed with ordinary engineering tools, and the whole reassembled and placed back into operation in the course of a few hours—truly a remarkable achievement.

These new developments have made possible the manufacture of valves capable of dealing with inputs considerably greater than 500 kW, and demountable continuously-evacuated valves of many times this power (in itself several times that of what was previously the world's largest) are in no sense a visionary prospect.



New Valve at Rugby (G.P.O.), showing Anode, Filament, and Grid Construction

It is fitting that at a time when the homage of the scientific world is being paid to the memory of Michael Faraday, British inventive genius should add yet another outstanding discovery to its record of achievement. It is gratifying also that the G.P.O. regards this achievement as of such outstanding importance and merit that it is exhibiting the new 500-kilowatt valve at the Albert Hall.

To dilate at any length on its future possibilities would be premature. While the new development will be of vast importance, primarily for wireless communication, the possibility of handling such large power and of utilising the diversity of application which characterises the thermionic valve opens up prospects of momentous future changes in electrical engineering practice.

Prices for Industrial Electric Power

THE average price charged by authorised undertakings for electricity supplied to consumers for motive-power purposes *only* in 1929-30 was 0.82d. per kWh. It is stated in our correspondence columns this week that in more than 90 per cent. of the undertakings this price exceeds the general average; we have worked it out from the statistics of the Electricity Commissioners to be 1.05d. per kWh.

Undertakings (61 in number) which charged lower prices than the general average had a group figure of 0.65d. per kWh. They supplied 3,143 million out of a total of 5,408 million power kWh, for which they received £8,509,000 out of a total power revenue of £18,420,000. The names of these undertakings are tabulated below. Figures for the Craven Hydro-Electric Supply Co. and the Exe Valley Electricity Co., Ltd., are not included, as the results of a full year's working are not yet available.

UNDERTAKINGS CHARGING AN AVERAGE RATE FOR MOTIVE POWER OF LESS THAN 0·82d. per KWh

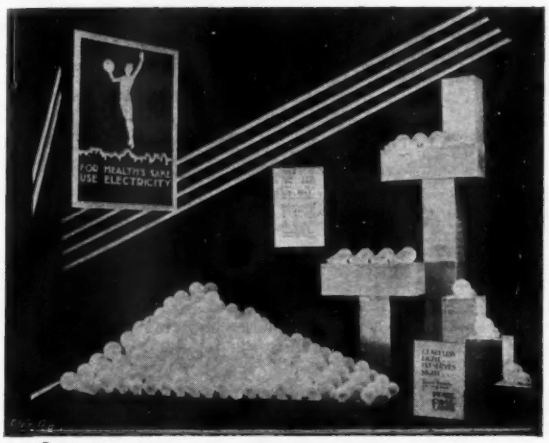
Undertaking.	KWh sold (Thousands).	Average price per kWh sold. Pence.
Kent Electric Power Co.	98,656	0.40
Newcastle-upon-Tyne E.S. Co. and Assoc. Co's.	640,868	0.50
Darlington Corporation	19,907	0.52
Stalybridge, &c., Electricity Board	37,239	0.55
Wallasey Corporation	10,235	0.55
Derby & Notts Electric Power Co.	80,166	0.56
Maidstone Corporation	22,426	0.58
Rotherham Corporation	74,534	0.58
Oldham Corporation	38,504	0.59
Stretford & District Electricity Board	60,403	0.60
Heston & Isleworth U.D.C.	11,617	0.61
Mersey Power Co. Ltd.	61,492	0.62
Sheffield Corporation	140,295	0.65
Coventry Corporation	82,306	0.66
Gravesend Corporation	10,868	0.66
North Wales Power Co. Ltd.	44,159	0.66
South Wales Electric Power Dist. Co.	63,491	0.66
Lancashire Electric Power Co.	107,908	0.67
Liverpool Corporation	106,036	0.67
Atherton U.D.C.	5,223	0.69
Bedfordshire, Cambs & Hunts Electricity Co.	5,878	0.69
Burton-on-Trent Corporation	23,472	0.69
St. Helens Corporation	33,843	0.69
Gillingham Corporation	4,029	0.70
Middleton Corporation	8,069	0.70
Rochdale Corporation	66,463	0.70
Edinburgh Corporation	52,359	0.71
Gorseinon Electric Light Co. Ltd.	2,284	0.72
Salford Corporation	38,894	0.72
Wolverhampton Corporation	56,240	0.72
Cardiff Corporation	17,789	0.73
Hull Corporation	71,014	0.73
Stockport Corporation	27,970	0.73
Ashton-under-Lyne Corporation	5,999	0.74
Bolton Corporation	48,676	0.74
Bury Corporation	19,203	0.74
Newport Corporation	23,091	0.74
Accrington Corporation	10,691	0.75
Barrow-in-Furness Corporation	13,115	0.75
Chesterfield Corporation	8,011	0.75
Clyde Valley Electrical Power Co.	187,432	0.75
Hampstead M.B.C. (including domestic power)	10,760	0.75
Luton Corporation	22,828	0.75
Bedford Corporation	11,786	0.76
Lincoln Corporation	17,307	0.76
Manchester Corporation	196,451	0.76
Peterborough Corporation	23,370	0.76
Yorkshire Electric Power Co.	116,697	0.76
Cumberland Waste Heat Owners Co., Ltd.	5,433	0.77
Grimsby Corporation	8,881	0.78
Leeds Corporation	71,610	0.78
West Ham Corporation	47,868	0.78
Llanelly & District Electric Supply Co. Ltd.	18,774	0.79
Stoke-on-Trent Corporation	28,576	0.79
Coatbridge & Airdrie Electric Supply Co. Ltd.	15,553	0.80
Fulham M.B.C.	11,205	0.80
Swansea Corporation	26,803	0.80
West Kent Electric Co. Ltd.	7,140	0.80
York Corporation	16,448	0.80
Dundee Corporation	30,776	0.80
British Insulated Cables Ltd. (Prescot, etc.)	13,614	0.81

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The E.D.A. October Programme

Particular attention is drawn by the British Electrical Development Association, in its programme for October, to the lighting season and more particularly to home lighting, the two window displays for the month being devoted to lighting fittings and lamps. One of these, the lamp display, is shown in the accompanying illustration, and it will be seen that the modern note combined with simplicity has resulted in an effective display. As usual, the materials required



The E.D.A. Lamp Display

for the window setting can be obtained from the Association. The literature for the month also covers the lighting season, and the programme contains a price list of the various publications. A diary of conferences and lectures in London and the provinces for the 1931-32 session is included, while the usual monthly features are retained. The London salesmanship conferences are as follows:—

October 16th: Lecture on light therapy with particular reference to ultra violet rays.

November 20th: Social evening, with an address on "The Future of the Electrical Industry."

January 15th: Lecture on electrical refrigeration.

February 19th: Social evening, with an address on scientific selling.

March 18th: Salesmen's and saleswomen's competition.

Trade Depression in the United States

The continued decline in sales of electrical goods in the United States shows no signs of abating, according to statistics appearing in the August issue of the *Survey* of the National Electrical Manufacturers' Association (U.S.A.). These statistics compare the output of its various members during May and June with last year's figures and, although all the firms in each branch of the industry are not covered, some indication may be obtained of the trading conditions now prevailing. For the two months mentioned, the sales of a.c. motors (1,200 h.p.) and control equipment amounted to $3,470,325 as compared with $6,226,747 in the corresponding period of 1930; d.c. motors (1,200 h.p.) also declined from $1,568,128 to $842,607. Only a comparatively slight decrease was, however, shown in the value of fractional h.p. motors, these falling from $4,879,510 to $4,436,026. There were serious declines in orders for power switching equipment, indoor equipment in particular showing a decrease from $300,489 to $126,265. Electric furnaces, however, continued to be the worst feature of the market; the value of orders received for these was only $159,625, as against $680,222 in 1930.

Economic Conditions in Bolivia

A report dated May, 1931, has been prepared by Mr. H. A. Hobson, Acting British Consul-General, La Paz, for the Department of Overseas Trade, on economic conditions in Bolivia (H.M. Stationery Office, 1s. net). The report states that Bolivia is passing through an acute economic crisis, due almost entirely to the unprecedented drop in the price of tin which constitutes the country's principal wealth and export. The total value of exports during 1930 amounted to Bs. 107,305,247, a decrease of Bs. 32,701,792, while imports showed a value of Bs. 56,829,898, a decrease of Bs. 14,587,376. Detailed figures for 1930 are not, however, available. In electrical goods, the United States and Germany have the chief share of the market, Great Britain occupying third place. The Bolivian Power Co., Ltd., a Canadian company, controls the electric lighting, telephones and tramways of La Paz and Oruro. It has a power station at Oruro and a transmission line extends as far as Huanuni, about thirty miles away, to supply power to work a tin dredger operating there. The company is to extend its power lines later to cover the districts of Oruro and La Paz and is also planning a network of telephone communications in the Oruro district. Electric cable of British manufacture is being used by the company in its lighting and telephone work.

Egyptian Electrical Imports

The Egyptian Customs Administration has recently published returns of the country's foreign trade during 1930. In the import list, under the heading "Electrical and mechanical machinery, insulated cables and wires, lamps, batteries and accumulators, telephone and telegraph apparatus, &c.," a total value of £E2,266,000 is given, as compared with £E2,039,000 in 1929. Of the total, machinery represents about £E1,684,000, against £E1,207,000. Most of this material has been imported in connection with Government projects and new factories.

The Board of Trade figures for 1930 show that the following electrical equipment was shipped to Egypt from this country during 1930, the figures being compared with those of the preceding year:—

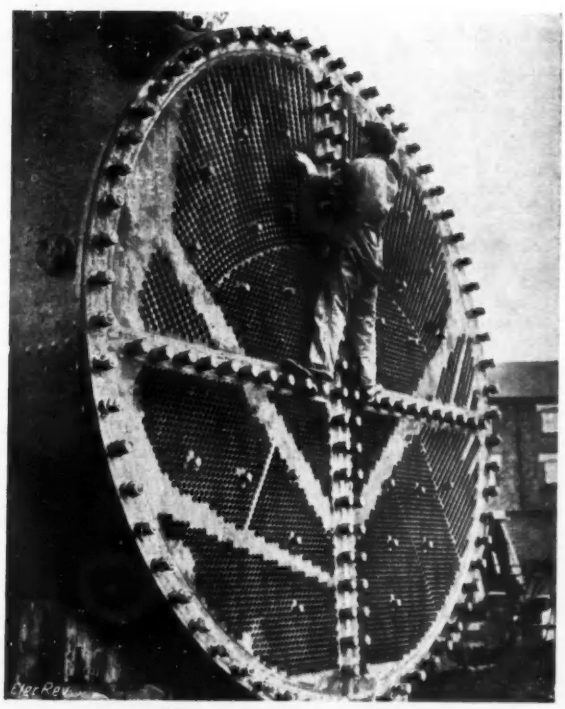
	1929 £	1930 £	Inc. or dec. £
Wires and cables, rubber insulated	98,029	3,319	– 94,710
Ditto, telegraph and telephone	47,622	43,539	– 4,083
Radio apparatus	8,749	14,985	+ 6,236
Telegraph and telephone apparatus	103,210	63,366	– 39,844
Accumulators	5,073	4,112	– 961
Lighting fittings and accessories ...	5,509	4,875	– 634
Unspecified electrical goods ...	26,214	25,482	– 732
Total electrical goods and apparatus	311,129	178,791	– 132,338
D.c. generators	4,658	2,857	– 1,801

Patent Restoration Application

Application has been made by F. A. Hayes for restoration of Patent No. 235,509 entitled "Improvements in and relating to variable speed power transmission mechanism."

Condensers for Battersea Station Delivered

Two of the largest condensers ever made in this country have just been delivered at the London Power Company's new power station at Battersea. Some idea of their size may be obtained from the picture below; when installed they will be coupled to form one unit with a total cooling surface of 60,000 sq. ft. Each of these condensers has a steam capacity of 185,000 lb. per hour and will maintain a vacuum of 29 in. Each has a tube surface of 30,000 sq. ft., the tubes passing about three million gals. of water per hour. The brass tube plates, 1¼ in. thick and each with a superficial area of 135 sq. ft., were made specially for the constructors by I.C.I. Metals, Ltd. Too large to be sent by rail, the condensers have had to be transported to London by sea and road from the works of the makers, Messrs. Richardsons, Westgarth & Co., Ltd., at Hartlepool.



One of Battersea's New Condensers

Buy British Goods

"It is the plain duty of every British citizen at the present time to give all the help he can to British industry by buying British goods. Anyone who imports foreign goods unnecessarily is rendering a real disservice to his country; and the Government are confident that both individual buyers and traders will recognise this common obligation."—Sir P. Cunliffe Lister, President of the Board of Trade.

Recent Contracts

MESSRS. BLACKSTONE & CO., LTD., have received a contract for the supply and erection of the whole of the machinery required for the Eastleigh and Bishopstoke sewerage scheme called for under the Engineer's contract No. 2. The machinery comprises the complete power house plant for the supply of electricity for driving the sewage pumps and lighting, including alternators, main switchboard and automatic switchgear. The pumping station equipment to deal with the crude sewage and storm water will be automatic in operation, and thirteen vertical Blackstone "unchokeable" pumps varying in size from 4 to 14 in. will be installed, each complete with a slip-ring motor, automatic starting and stopping control panel, and float gear. The pumping stations being situated at some distance from the power house, a special type of automatic indicating apparatus is provided for. The contract, which is valued at approximately £14,000, also includes transformers, transmission cables, lighting, telephones, wiring and pipes.

The HART ACCUMULATOR CO., LTD., has recently installed a storage battery and "Safetylyte" automatic control panel for the emergency electric lighting of the Albert Hall, Peter Street, Manchester.

Italian Lamp Production

The number of electric lamps produced in Italy during April last amounted to 1,845,915, bringing the total for the first four months of the year to 7,746,085, as compared with 8,023,952 in the corresponding period of last year.

German Electrical Imports and Exports

The official returns just to hand show that the value of imports of electrical machinery and apparatus into Germany during the seven months ended July last amounted to £1,077,650 as compared with £1,211,150 in the corresponding period of 1930. There was also a decline during the same period in the exports of similar material from Germany—from £16,199,300 to £13,681,600.

Hints for Commercial Visitors

Two further memoranda of the "Hints for Commercial Visitors" series have just been issued by the Department of Overseas Trade. These relate to Rumania (No. C.3646) and the United States (No. C.3648), and give useful information with regard to travelling facilities, hotel accommodation, etc.

Faraday Celebrations at Willesden

In connection with the Faraday Centenary Celebrations, Willesden Urban District Council has this week been holding an electrical exhibition at the Drill Hall, Pound Lane, Willesden. The electrical manufacturers and contractors exhibiting have been limited to those having factories or offices in the district. On the stand of the Electricity Department, besides a variety of domestic appliances, is shown an electric kitchen and bathroom. Automatic telephone and teleprinter systems are demonstrated by the G.P.O. Engineering Research Station, which is also exhibiting a telephone instrument efficiency testing set and apparatus used in commercial radio stations. The stand of the British Thomson-Houston Co., Ltd., in addition to displaying the company's range of domestic appliances, has a replica of Faraday's lecture table equipped with apparatus identical with that used by Faraday when announcing his discovery of electro-magnetic induction. The other electrical firms exhibiting are: The Kenbar Electrical Co.; the Crypto Electrical Co., Ltd.; Vac-Tric, Ltd.; Bratt Colbran & Co.; the K.F.M. Engineering Co., Ltd.; F. W. Needham; the Zenith Electrical Co., Ltd.; A. J. Holt; Greene and Son; Duncan Mays; the Aron Electricity Meter, Ltd.; Langley & Son; Smith's Electric Clocks, Ltd.; Watson, Marsh & Co. (Brondesbury), Ltd.; G. A. Turner; the Hall Telephone Accessories (1923), Ltd.; and H. Lewis. At a luncheon held at the Electricity Offices, prior to the opening ceremony on Monday, Sir John Brooke, vice-chairman of the Electricity Commission, complimented the Electricity Department on its policy of taking a bulk supply of electricity and thus being able to devote its full attention to its distribution system. Opening the exhibition, Sir John said that Faraday had brought a free intelligence to bear on his problems and to achieve success one must attempt to emulate his spirit. He congratulated Mr. A. W. Blake (the Willesden electrical engineer) and the Electricity Department on their enterprise in organising the exhibition.

The Canadian Radio Industry

The Canadian radio industry has been suffering seriously from competition with heavy importations from the United States, placed on the market at very low prices. The Dominion Government has given additional tariff protection to the industry by the issue of an Order-in-Council fixing a discount rate of 30 per cent. on the factory list prices of radio receiving sets imported into Canada. Canada's importation of radio sets, valves and components during the fiscal year ended March 31st last amounted in value to $8,082,117, of which amount $7,953,212 was imported from the United States.

The F.B.I. and the Financial Situation

The attitude of the Federation of British Industries with regard to the proposals of the Government for dealing with the financial situation is outlined in a statement sent to the Prime Minister last week. The Grand Council of the Federation states that it will support the Government to the utmost of its power in its task but adds that the heavy additional taxation will inevitably increase the burdens on industry, will raise the cost of manufacture, and so further handicap export trade. Still further economies, therefore, in both national and local expenditure are matters of the utmost urgency in order to correct the disparity between the standard of public expenditure in Great Britain as compared with that in foreign countries. Important as balancing the Budget may be, the adverse balance in foreign transactions is a fundamental cause of the present difficulties, and the Federation notes with satisfaction that this matter is receiving immediate and special consideration by the Government. In the opinion of the Federation the remedy lies in the introduction of an immediate and adequate emergency tariff with the object of dealing with to-day's situation, and to prevent dumping; and thereafter in the establishment of a fiscal system which will combine the protection of industrial and agricultural interests at home with the widest possible development of inter-Empire trade.

Book Notices

"Wireless—A Treatise on the Theory and Practice of High-frequency Electric Signalling," by L. B. Turner. Pp. xviii+528; figs. 342. London: Cambridge University Press. Price 25s. net.

"The Revised Callender Steam Tables (1931)." Published for the British Electrical and Allied Industries Research Association. Pp. 56. London: Edward Arnold & Co. Price 12s. 6d. (with thumb index) and 10s. 6d. (without thumb index.

"Principles of Electricity," by L. Page and N. I. Adams, Junr. Pp. xii+620; figs. 319. London: Chapman & Hall, Ltd. Price, 21s. net.

"Ralph Stranger's Wireless Library for the Man in the Street," Nos. 13 to 18. Pp. 64 each volume. London: George Newnes, Ltd. Price 1s. each volume.

Employment During August

The September *Ministry of Labour Gazette* states that employment in the engineering industry during August remained bad and showed some further decline in all sections. In electrical engineering employment remained slack although much better than in other sections. The number of unemployed in the engineering industry as a whole on August 24th increased to 275,744, representing a proportion of 27.1 per cent. (against 26.7 per cent. in July). In the electrical section the figure was 15 per cent., as compared with 14.7, the total being 13,452. The number of unemployed in the electric cable, wire and lamp manufacturing group, at 15,324, showed a slight decrease from 15.6 to 14.9 per cent., while the total of 3,362 in the electrical wiring and contracting industry represented a decline from 20.9 to 18.2 per cent.

Trade with Finland

According to *The Times*, it was decided at a meeting of Finnish and British business men held recently in Helsingfors to form a society for developing Anglo-Finnish trade. Great Britain at present takes 40 per cent. of Finnish exports, but British goods represent only about 14 per cent. of Finnish imports.

German Machinery Industry

According to the German Machine Union's report, quoted by *Reuter's Trade Service*, all branches of the German machine industry suffered from bad business in August. Home sales of certain kinds of agricultural machinery and drying-apparatus were rather brisker than in the previous month, but this business was up to 50 per cent. smaller than last year. As for export business, only a few firms, for example pump and pulverising-machine manufacturers, received a larger number of orders, the majority of firms recording a decrease. Business was exceedingly small in mining, printing, paper-making, transforming and power-generating machinery.

Local Exhibition

The Gravesend Corporation Electricity Department and the local electrical contractors had very attractive displays in an "Empire and Industrial Exhibition" held at the Gravesend Drill Hall last week. The Electricity Department concentrated attention on cooking and water heating, for which it offers apparatus on hire-purchase and hire terms, combined with an attractive tariff. Cooking demonstrations on "Jackson" apparatus were given daily, and the "Sadia" display included a water-heater cut away to enable the method of operation to be explained. Good results are reported; many inquiries were received and definite contracts made. The following local electrical contractors combined to make a bright and varied display of equipment and appliances:—Messrs. S. G. Allen & Son, Coles & Martin, E. E. Fairlamb, Redman and Simmons, Missing's Wireless Depôt (Capt. J. C. de Wardt, A.M.I.E.E.), Harris & Sons, & Lambert's. The prominent

features of the stand were a number of examples of "Magicoal" fires, "Progress" washing machines (C.C.A. (Vacuum Cleaners), Ltd.), shown in operation, and living representations of the well-known "Mazda" dancing girl, and the "Goblin" of the British Vacuum Cleaner and Engineering Co., Ltd. Messrs. Bennett & Brown had a separate stand devoted to radio and electrical apparatus.

Disposal of Polish Electrical Works

It is stated that a Polish industrial group has offered to dispose of the electro-technical works in Zychlin and Teschen to Brown, Boveri & Co., of Mannheim. The latter are declared to have expressed their willingness to negotiate in the matter and if an agreement should be reached the Swiss parent company would render technical aid in the continuation of the Polish works, which were to have been stopped.

Polish Import Duties

A decree has been issued by the Polish Government which increases on September 26th the import duties on a number of products by about 100 per cent. These include glow lamps, cathode lamps for radio purposes, aluminium, electrotechnical apparatus and appliances, internal combustion engines, electric pumps and insulating tubes.

New Electricity Showrooms and Offices

The new electricity showrooms and offices of Barnoldswick Urban District Council are to be inaugurated on September 28th, by Mr. H. Wilson, chairman of the Electricity Committee.

Wages in the Cable-making Industry

We are informed by the Joint Industrial Council for the Electrical Cable-making Industry that the September 1st index figure is 45 per cent. above the 1914 level and that there will be no alteration in wages on the third pay day in October.

Costa Rican Tariff Increase

The Government of Costa Rica has raised the import duty on radio apparatus and accessories from 0.40 to 1.00 colone per kg. gross.

Trade Announcements

The Bristol branch of SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., has been transferred to more extensive premises at 10 and 12, Marsh Street. The telegraphic address and telephone numbers remain unchanged.

Messrs. JOHN BENNIE, LTD., Star Lift Works, Glasgow, have removed their London premises to 39, Victoria Street, S.W.1 (telephone: Victoria 7115, three lines). The company has also opened new premises at Manchester, Leeds, Dublin, Liverpool, Newcastle-upon-Tyne, and Edinburgh, and in addition has appointed agents for Singapore, Kuala Lumpur, Ipoh, Australia, South Africa, China, India, etc.

We are informed that a newly formed company, BURN SILENT GEARS, LTD., of Caxton House, Westminster, S.W.1, has taken over the British rights of the Silent Burn Gear, including those previously held by Messrs. Stothert and Pitt, Ltd., of Bath, and Burn Transmissions, Ltd. The gears are being produced in co-operation with Messrs. James Howden and Co., Ltd., Glasgow.

New Italian Companies

Among the new companies recently formed in Italy are:—La Società Italiana Communicazione Radio-Aeree, Rome, 100,000 lire; La Società Telemeccanica Elettrica, Ing. Luria e Gregorini, Milan, 850,000 lire; La Società Consorzio Padano per Distribuzione Energia Elettrica, Milan, 100,000 lire; La Società Industrie Elettriche Ing Giampiero Clerici, Milan, 100,000 lire; La Società Officine Elettromeccanithe Milanesi, Milan, 110,000 lire, and La Società La Superba, Fabbrica Italiana Accumulatori Garbarino, Genoa.

Prices of Materials

Messrs. James & Shakespeare report, September 23rd: Copper bars (best selected), sheet and rod, £67, £5 inc. English pig lead, £14 5s., £2 5s. inc.

Messrs. Edward Till & Co. report, September 23rd: India-rubber, Para fine, no change.

New Catalogues and Lists

The LANCASHIRE DYNAMO & MOTOR CO., LTD., Trafford Park, Manchester.—Leaflets describing low-speed and light-duty types of "Crypto-Langham" geared motor units.

CALLENDER'S CABLE & CONSTRUCTION CO., LTD., Hamilton House, Victoria Embankment, London, E.C.4.—Pamphlet No. 115, dealing with "Callender" insulating and protective tapes. Illustrated and priced.

KORTING & MATHIESEN ELECTRICAL, LTD., 711 & 715, Fulham Road, London, S.W.6.—Revised price lists (Nos. 1228C and F1928B) of "Kandem" floodlight projectors and reflector fittings for industrial lighting.

T. B. MORLEY & CO., LTD., Jameson Street, Hull.—A 52-page catalogue of the new season's "Morco" illuminating glassware. Profusely illustrated throughout, largely in colour.

A. REYROLLE & CO., LTD., Hebburn-on-Tyne.—Pamphlet No. 809, illustrating and describing the company's flameproof switchgear for coal mines.

CARRON COMPANY, Carron, Falkirk.—A well-produced catalogue of "Carron" electric fires, cookers, and smaller domestic apparatus. The fires are illustrated in colour and include many handsome designs. Particulars and prices are given in each case.

HARLIE BROS. (EDMONTON), LTD., Balham Road, Lower Edmonton, London, N.9.—A pamphlet giving particulars of "Harlie" gramophones, tone-arms, pick-ups, electric gramophone motors, microphones, loud-speakers, &c.

THOMAS A. ROSE & SON, LTD., 25, Milton Street, London, E.C.2.—The 1931-332 catalogue of plugs, switches, junction boxes, bells, bell pushes, lampholders, torches, cycle lamps, and general electrical instruments and accessories.

MATTERSON, LTD., Healey Works, Shawclough, Rochdale.—Section X of the company's catalogue, dealing with self-sustaining electric hoists.

J. H. TUCKER & CO., LTD., King's Road, Tyseley, Birmingham.—A new general catalogue (No. G. 32) of the company's products, which include ironclad switch- and fuse-gear, fuse and distribution boards, plugs and sockets, switches, ceiling roses, lampholders and other electrical accessories.

BATWIN ELECTRICAL APPLIANCES, LTD., 138, Southwark Street, London, S.E.1.—A booklet illustrating and describing the new "Batwin" flashers.

RICHARD JOHNSON, CLAPHAM & MORRIS, LTD., Jacem House, Trafford Park, Manchester.—A 126-page illustrated catalogue of "Jacem" electrical appliances, which include lighting fittings, fires, cookers, and other domestic appliances, cables, bells, torches, and miscellaneous accessories.

The BRITISH VACUUM CLEANER & ENGINEERING CO., LTD., London, S.W.6.—A folder announcing a competition, with prizes amounting to £250, for the best window displays of "Goblin" vacuum cleaners. The competition will commence on October 1st.

The MULLARD WIRELESS SERVICE CO., LTD., Mullard House, Charing Cross Road, London, W.C.2.—A folder, in two colours, giving details of the 1932 "Mullard—3" receiver.

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.—Booklet O.S. 5870, dealing with special "Osram" lamps for such purposes as sound film work, colour light signalling for railways, television, lighthouses, photography, &c. The new season's "Osram Wireless Guide," which, besides giving full particulars of the various types of "Osram" radio valves, contains a quantity of other informative matter of interest to owners of radio receivers.

BEACONECTRIC, LTD., 158, Stonhouse Street, High Street, Clapham, S.W.4.—An illustrated catalogue of lampholders, switches, switch-plugs, adaptors, conduit fittings, switchgear, domestic appliances, lighting fittings, industrial and shop window reflectors, floodlight projectors, signs, bells, time switches and general accessories.

FERRANTI, LTD., Hollinwood, Lancs.—List Wb 534, giving details of "Ferranti" a.c. mains receivers and "consoles."

JOHN SHAW & SONS (WOLVERHAMPTON), LTD., Wolverhampton.—A folder describing the "Trojan" thermo-electric inhaler.

J. J. EASTICK & SONS, 118, Bunhill Row, London, E.C.—A Radio Exhibition number of the "Eelex Radio Bulletin," containing detailed descriptions of the latest types of receivers, components and accessories, and an article on induction troubles.

CREDENDA CONDUITS CO., LTD., Oldbury, near Birmingham.—Two illustrated catalogues describing the new season's "Creda" fires, irons, kettles, cookers, water heaters, tubular heaters, boiling plates, &c. Ten new models of fires are announced, imitation coal fires now being made under "Magicoal" patents.

Bankruptcy Proceedings

J. D. Waller, electrical engineer and contractor, 9, Sackville Street, Skipton, Yorkshire.—The public examination was held on September 15th at the County Court, Manor Row, Bradford. A statement of affairs was submitted which showed gross liabilities of £336, and an estimated deficiency of £308. Debtor said that he began business in June, 1926, as an electrical engineer, without capital. The business was successful and later he removed to larger premises. The overhead expenses at the latter were heavy, and creditors began to press. On March 7th, 1930, debtor executed a deed of assignment, but had paid no dividend. He recommenced business as an electrical engineer at 9, Sackville Street, Skipton. His customers allowed him to deal on credit, but owing to pressure by certain creditors who had not assented to the deed of assignment, debtor fell into arrears with the other creditors. In July, 1930, he was approached by two persons with a view to the formation of a certain wireless service company at Skipton. He spent a good deal of time in the company's affairs, leaving his own business in other hands. Debtor attributed his position to "bad trade and lack of capital." The examination was adjourned for closing.

F. E. Saunders, electrical engineer, 10a, Page Street, Westminster, London, S.W.—This debtor filed his petition on September 8th, and the statutory first meeting of his creditors was held on Monday at Bankruptcy Buildings, Carey Street, W.C. It appears, from statements that the debtor has made, that he has traded at the above address for the past three years under the style of Saunders & Co. His present financial position has arisen from the withdrawal of a contract by the L.C.C. on the ground that he was behind time and the Council is now completing it. At the time of its withdrawal certain moneys were due to him for work completed, and these he had assigned to a firm of electrical suppliers to whom he was then owing £800. He estimates his liabilities at £1,200, and adds that his assets consist of a claim against a limited company for arrears of salary as a former director, office furniture and stock, and also private furniture of the value of about £150. The debtor attributes his failure to the cause mentioned, also to bad debts and insufficient working capital. It appeared that the Court had already made an order adjudging the debtor a bankrupt, and

the meeting passed a resolution for the appointment of Mr. M. G. Hacker (Hacker, Rubens & Co.) as trustee of his estate.

B. Marsh, electrician, 17, Victoria Road, Brighton.—Trustee, Mr. A. E. Orbell, 6 and 7, Old Steine, Brighton, released July 29th.

J. W. White, radio and electrical engineer, 32, Castledene Road, Parkstone.—Last day for receiving proofs for dividend, October 5th.—Trustee, Mr. F. H. Langmaid, Midland Bank Chambers, High Street, Southampton, Official Receiver.

D. J. Davies, wireless engineer, 36, Cambrian Street, Aberystwyth.—Trustee, Mr. H. W. Thomas, 4, Queen Street, Carmarthen, Official Receiver, released August 11th.

J. Bainton, electrician and radio engineer, 86, Wheelock Street, Middlewich.—Trustee, Mr. C. J. Pyke, 12, Lonsdale Street, Stoke-on-Trent, Official Receiver, released August 5th.

J. A. Morgan, radio dealer, Old Queen's Head, Crickhowell.—Trustee, Mr. E. Owen, 34, Park Place, Cardiff, Official Receiver, released August 11th.

W. H. Thornton, electrical and wireless engineer, 25, Bridge Street, Burnley.—Supplemental dividend of 11¼d. in the £, payable September 25th at the Official Receiver's office, District Bank Chambers, Blackburn.

J. G. Ritchie, electric lamp dealer, 54, Woodsley Road, Leeds.—Discharged as from August 25th, 1931.

J. Atkins (Atkins & Co.), electrical engineer, 59, Church Street, Tewkesbury.—Trustee, Mr. R. A. Rodgers, Coventry House, South Place, E.C., released July 24th.

F. T. Johnson, electrical engineer, 60, Eltisley Avenue, Newnham, Cambridge.—Last day for receiving proofs for dividend, October 2nd.—Trustee, Mr. J. L. Wilkinson, 41, Sidney Street, Cambridge, Official Receiver.

E. P. Sturgeon, electrical engineer, 88, Northgate, Hartlepool.—Last day for receiving proofs for dividend, October 9th.—Trustee, Mr. T. A. Stoker, 71, Albion Street, Leeds.

Company Liquidations

Detex, Ltd., wireless manufacturers, Vauxhall Bridge Road, London, S.W.—The statutory meeting of creditors was held on September 15th at Caxton Hall, Westminster, London, S.W. The statement of affairs showed liabilities of £12,657 and assets totalling £4,496. It was stated that a conference of the creditors was held last May, when it was decided that a moratorium should be granted and the business continued. The directors, however, had found it impossible to continue, and resolutions had been passed for voluntary liquidation. Mr. C. Latham, of the Wireless and Allied Trades Guardian Association, said that after allowing for the possible contingencies of realisation, preferential claims, and items covered by charges, the net assets of the company would be £3,054. Mr. P. Houston pointed out that in May the approximate liabilities were stated at £9,621, against assets of something like £12,000, and the general manager of the company said that since that date the sales had amounted to £20,290, against expenses of £29,718. The purchases in the period had been £19,084. The company had marketed a radio gramophone set, the wholesale price being £10 10s. and the retail price £16 16s. There were 300 of those sets in stock, which the company was obliged to sell at £3 3s. each. The company had suffered through keen competition, and he declared that the market was being flooded with goods at ridiculous prices. Resolutions were passed confirming the voluntary liquidation of the company, with Mr. C. Latham and Mr. Howard as joint liquidators, together with a committee of inspection, consisting of the representatives of the Tungsram Electric Lamp Works, Fuller Accumulator Co., Expandit Suitcase Co., Darwin, Ltd., and E. Bayliss & Sons.

Thorpe and Thorpe, Ltd., electrical engineers, 38, Broad Street, Golden Square, London, W.1.—The statutory meeting of the creditors was held recently at the office of Messrs. Clark, Battams & Co., 3 and 4, Clements Inn, Strand, London, W.C., when a statement of affairs was submitted showing liabilities of £11,523. After allowing £103 for preferential claims, the net assets were £7,378, or a deficiency so far as the creditors were concerned of £4,145. It was stated that the cash claims included one of the trustees of Sir Arthur Wheeler's estate. The bank held a third-party guarantee. For the purpose of the statement the stock and other assets had been set down at their realisation value. The principal assets were the book debts and work in progress, and it was thought that they would realise the figures at which they had been included. The creditors passed a resolution confirming the voluntary liquidation of the company, with Mr. W. A. J. Osborne, of Messrs. Corfield & Cripwell, accountants and auditors, of Balfour House, Finsbury Pavement, London, E.C., as liquidator, together with a committee consisting of a representative of the trustee of Sir Arthur Wheeler's estate, the General Electric Co., Ltd., and Callender's Cable & Construction Co., Ltd.

The following are creditors:—

	£		£
Muir, Beddall & Co., Ltd.	53	M.K. Electric, Ltd. ...	91
Callender's Cable & Construction Co., Ltd.	742	Pirelli General Cable Co., Ltd.	127
General Electric Co., Ltd.	1,186	Tucker & Co., Ltd. ...	134
Lucy & Co., Ltd. ...	200	Walsall Conduits, Ltd.	51
		Pillinger, G. C., & Co. ...	302

Dominor Radio & Gramophones, Ltd.—We regret that in our our last issue the name of this company was incorrectly given as Dominion Radio & Gramophones, Ltd.

D. O. Williams & Co., Ltd.—Particulars of claims by October 17th to the liquidator, Mr. J. Smith, Midland Bank Buildings, Castle Square, Swansea.

Deal & Sandwich Electrical Co., Ltd.—Meeting, October 20th, at Bath House, 57-60, Holborn Viaduct, E.C., to receive an account of the winding-up by the liquidator, Mr. F. Paul.

Midland Motorsign Co., Ltd.—Winding-up voluntarily. Liquidator, Mr. T. F. Birch, Court Chambers, Friar Lane, Leicester. Particulars of claims to the liquidator by October 28th.

Telephone Manufacturing Co., Ltd.—Meeting, October 26th, at 2, Norfolk Street, Strand, W.C. to receive an account of the winding-up by the liquidator, Mr. F. C. T. Lane. The business of this company has been taken over by the Telephone Manufacturing Co. (1929), Ltd., and Telephone Rentals, Ltd.

Electricity Supply

Lighting, Domestic, Power

Aberfeldy (Perthshire).—SUPPLY NOW AVAILABLE.—The Central Electricity Board has finished laying its cables in Aberfeldy and supplies of electricity have already been given to many premises. At a recent meeting the Town Council decided to have electric lighting installed at the Town Hall.

Arbroath.—ELECTRICITY SUPPLY.—Following the coming into operation of the Grampian electricity scheme at Kinloch, Rannoch, the power station at Arbroath is now to be a distributing centre and sub-station. Arbroath will receive a bulk supply, which will be transmitted by e.h.p. overhead lines from Rannoch power station *via* Tummel Valley, Killiecrankie, over the hill, to Kirkmichael, and thence down to near Alyth, missing Kirriemuir and Forfar (to which places there are branch supply lines), and continuing right on to Friockheim, which is a distributing centre for the county. In Arbroath a development in the west end of the town includes the setting up of a small sub-station, intended primarily for the supply of energy to schools.

Bristol.—YEAR'S WORKING.—We have received from Mr. H. Faraday Proctor, chief engineer and general manager of the Corporation Electricity Department, a copy of the annual report and a statement of accounts of the electricity undertaking for the year ended March 31st last. The total revenue amounted to £665,901, as compared with £615,972 in the preceding year, while the working expenditure increased from £328,235 to £336,939. There was a gross profit of £328,962, as against £287,737, and after providing for capital and other charges, there remained a net profit of £19,550, as compared with £7,386 in 1929-30. During the year £256,656 was spent on capital account making a total of £5,440,187 now spent on the undertaking. Sales of electricity increased from 96,633,600 to 103,036,853 kWh and the maximum demand from 37,500 to 41,920 kW. The average price obtained per kWh rose from 1.443d. to 1.470d. New consumers numbered 5,918 (the record for any one year), bringing the total at March 31st to 43,446. The second instalment of the Portishead generating station was completed, the work comprising extensions of the turbo-generator house, the switch-house and the administrative block and the construction of the second condenser pit. These extensions provide accommodation for two generator sets, of 50,000-kW each, the first of which was installed together with all auxiliary plant. Two additional boilers with the necessary auxiliary plant were also installed completing the equipment of the existing boiler house. The higher efficiency of the Portishead station has already reduced the total coal cost per kWh sold (including that of the older generating station at Feeder Road which is now of necessity working under uneconomical conditions) by over 17 per cent.

Buckie.—INAUGURATION OF SUPPLY.—The new electricity supply was formally inaugurated on September 15th by Provost Merson. A large company inspected the power house under the guidance of Mr. J. McEwen, the engineer, and special floodlighting and other illuminations were arranged to celebrate the occasion. After the inauguration ceremony the town councillors, officials, and guests were entertained at the Town Hall at supper by the contractors, Messrs. T. Laurie & Co., of Falkirk. The Lord Lieutenant of Banffshire proposed the toast "Success to the Electricity Undertaking" and Provost Merson replied. The toast of "The Contractors" was proposed by Bailie Hendry, Mr. McEwen responding. The installation cost about £13,000, and approximately 150 services were ready for connection at the inception, both the Harbour and Lighthouse being now lighted by electricity. The rates for supply have been fixed at 8d. per kWh for lighting, and 3d. for power, with an alternative two-part rate of 8d. and 1½d. for domestic users. As the present distribution is on the three-wire system, two cores have been paralleled; all the underground services are four-wire. This should reduce the change-over costs should an a.c. 3-phase four-wire supply become available.

Burniston and Cloughton.—INAUGURATION OF SUPPLY.—An electricity supply for the villages of Burniston and Cloughton, near Scarborough, was inaugurated recently. For the lighting of St. Mary's church, Cloughton, concealed lights by Holophane, Ltd., have been installed.

Bury St. Edmunds.—LOANS SANCTIONED.—The Town Council has received sanction to the following loans: Mains, £10,000: sub-station equipment and kiosks, £5,000; and works in connection with the change of system of supply, £8,000.

Canada.—DOMESTIC ELECTRICITY CHARGES.—Official figures just published show that 87 per cent. of the domestic consumers of the Hydro-Electric Power Commission of Ontario obtain their electricity for lighting as well as heating and cooking at an inclusive average charge of less than 1d. per kWh. For example, last year in Toronto, where the Commission has 146,603 domestic customers, the average consumption per month was 128 kWh, the average monthly bill was 7s. 10½d., and the net cost to the householder was approximately ¾d. per kWh.

THE BEAUHARNOIS POWER SCHEME.—Mr. Taschereau, the Premier of Quebec, recently conferred with Mr. Bennett, the Prime Minister of Canada, at Ottawa, concerning the future

of the Beauharnois power project. *The Times* states that the Dominion Government insists upon the reorganisation of the company's personnel following the revelations before the Parliamentary Committee. The Dominion is to acquire the 15-mile navigation canal, leaving the power plant within the legislative jurisdiction of Quebec.

Continental.—RUSSIA.—In a booklet entitled "Social Economic Planning in the U.S.S.R.," specially prepared for the recent Social Economic Congress in Amsterdam, Mr. S. L. Ronin gives details of the rapid progress which is taking place in the output of electrical energy in Soviet Russia. It is stated that since 1913 when only 1,945 million kWh was generated, the output has increased steadily to 6,386 million kWh in 1929, and to 8,231 million kWh in 1930. The author estimates that having regard to the many new plants which are being established under the Five Years' Plan, the annual output should reach 22,000 million kWh by 1933. Some doubt is, however, thrown on these figures by reason of the fact that according to the *Moniteur des Intérêts Matériels*, of Brussels, the output of electrical energy in Soviet Russia during the seven months ended with July last amounted to 2,897,200,000 kWh, as compared with 2,136,300,000 kWh in the corresponding period of 1930, an increase of nearly 40 per cent. If the figures given by our Belgian contemporary are correct, the seven months' total would give an aggregate of 3,662 million kWh for 1930, and 5,120 million kWh for the current year.

ITALY.—A concession has recently been granted by the Italian Government for the establishment of a hydro-electric power station by the Società Elettrica Alto Adige, to utilise the power of the River Gardina, near Castellrotto, Bolzano. It is estimated that 9,580 h.p. is available. The Società per Distribuzione di Energia Elettrica "Ovesticino" is also to establish a 4,170 h.p. hydro-electric plant on the River Chiusella, near Vistronio, in the Province of Turin.

SWITZERLAND.—Steady progress is being made with the construction of a new hydro-electric power station on the Limmat, near Wettingen, for the municipality of Zurich, the estimated cost of which is £820,000. The initial plant will comprise three 10,000 h.p. Kaplan turbines, built by Escher Wyss & Co., Zurich, coupled to Oerlikon generators.

Cowdenbeath.—STREET LIGHTING.—The Town Council is to purchase the tramway standards belonging to Dunfermline and District Tramways Co., on the Perth Road and other routes, for conversion into lighting standards. The scheme will cost £780.

Darwen.—YEAR'S WORKING.—The accounts of the Corporation Electricity Department (engineer, Mr. F. M. Fletcher) for the twelve months ended March 31st last, show a total revenue of £33,207, and a working expenditure of £20,656, leaving a gross profit of £12,551. After deducting capital and other charges there was a net profit of £3,264, as against £6,959 in the preceding year. During the year the capital expenditure amounted to £12,599, making a total of £202,710 now spent on the undertaking.

Derby.—LOAN.—The Town Council has applied for sanction to a further loan of £20,000 for electricity purposes.

Douglas.—YEAR'S WORKING.—In his report for the year ended March 31st last, Mr. Bertram Kelly, borough electrical engineer and manager, states that the total revenue of the electricity undertaking amounted to £40,842, while the working expenditure was £20,226, thus leaving a gross profit of £20,616. To this was added £664 brought forward from the previous year and £600 estimated revenue due to a later meter reading, making a total of £21,216. After deducting interest on loans and sinking fund contributions there was a net surplus of £733. Capital outlay during the year amounted to £8,060, bringing the total now spent on the undertaking to £301,415. Electrical energy sold increased from 2,035,232 to 2,220,655 kWh, the average price obtained per kWh rising from 3.88d. to 3.93d.; the maximum demand was 1,323 kW. The number of consumers at March 31st was 2,711, an increase of 235 during the year.

Fleetwood.—YEAR'S WORKING.—The accounts of the Urban District Council Electricity Department (engineer: Mr. W. P. Lilwall) for the year ended March 31st last, record a total revenue of £37,293 and a working expenditure of £19,060, leaving a gross profit of £18,233. The corresponding figures for the preceding year were: Income, £34,027; working expenses, £18,017; gross profit, £16,010. There was a net profit of £51, as against £251 in the preceding year. During the year the capital expenditure amounted to £19,195, making a total of £167,427 now spent on the undertaking. Electrical energy sold increased from 3,491,855 to 3,897,571 kWh, but the maximum supply demanded fell from 1,970 to 1,932 kW. The number of consumers at the close of the year was 4,341 (an increase of 84), while assisted wiring installations totalled 1,794.

Glasgow.—PROGRESS DURING AUGUST.—Under the Corporation Electricity Department's scheme 483 houses were wired in August, bringing the total to 33,920, while hired appliances installed numbered 32, making a total of 20,448.

MAINS EXTENSIONS.—The Corporation Electricity Committee recommends the laying of distributing mains at a cost of £7,633.

Golborne (Lancs).—PUBLIC LIGHTING.—The Urban District Council has decided to have the public lamps in Edge Green Lane converted from gas to electricity, and to request the Lancashire Electric Power Co. to extend its mains in that district in order that the conversion may take place before the commencement of the next lighting season.

Great Yarmouth.—NEW ELECTRICITY CHARGES.—The Town Council has adopted the following new electricity tariff:—Lighting (all classes): 5d. per kWh in the borough and 7d. per kWh for outside areas, subject to a discount of five per cent. for prompt payment, and five per cent. rebate to consumers of over 10,000 kWh per annum. Cooking and heating: Summer quarters, ¾d. per kWh in the borough and 1d. outside; winter quarters, 1d. per kWh in the borough and 1½d. outside. Power: From 1½d. per kWh for consumers of less than 10,000 kWh per quarter, to 0.85d. for consumers of over 100,000 kWh per quarter. Combined tariff for domestic premises: 15 per cent of rateable value, plus a "unit" charge of ½d. in the borough, and ¾d. outside in the summer quarters, and ¾d. in the borough and 1d. outside in the winter quarters, subject to a guaranteed minimum consumption of 600 kWh per annum. Combined tariff for business premises: £13 10s. per annum for the first kW of lighting, and £9 per annum for each additional kW, plus a "unit" charge of 1d. in the borough and 1½d. outside. A new combined tariff for industrial works has also been introduced.

Handforth (Manchester).—ELECTRICITY SUPPLY FORTHCOMING.—The Alderley Edge and Wilmslow Electricity Board has informed the Urban District Council of its intention to supply the town with electricity.

Hinderwell (Yorks).—ELECTRICITY SUPPLY.—At a recent meeting of the Urban District Council, Mr. E. C. Lennox, and Mr. T. T. Willis, representing the Cleveland and Durham County Electric Power Co., attended and explained the scheme for the supply of electricity to the town. It was decided that the clerk should prepare the necessary forms for carrying out the scheme, and make application for sanction to a loan and for an unemployment grant.

Lincolnshire.—ELECTRIFICATION SCHEME APPROVED.—A scheme for the electrification of Mid-Lincolnshire and Kesteven, prepared by Mr. R. Borlase Matthews, has received the final approval of the authorities and will be carried out by a public utility company. Skegness will be the first town to receive a supply, which will be available by next spring.

London.—SHOREDITCH.—A gross profit of £87,519, as compared with £82,987 in 1929-30, is recorded in the annual report of the Borough Council Electricity Committee for the year ended March 31st last. A net balance of £22,322 on appropriation account is carried forward. Electricity sold increased from 22,320,320 to 23,001,386 kWh, and the number of consumers at the end of the year was 15,205, an increase of 2,439 over the previous year, of which 2,395 were "free-wired" consumers. The total number of installations provided under the free wiring scheme is now 11,172.

ISLINGTON.—The Borough Council Electricity Committee reports a net profit of £50,666 on the electricity undertaking for the past year.

HAMMERSMITH.—The Borough Council has received sanction to the borrowing of £11,616 for mains, and £14,596 for plant. A sum of £12,500 for meters is to be provided from revenue.

ST. PANCRAS.—The Borough Council Electricity and Public Lighting Committee recommends the following schemes:—Extension of mains (£979); provision of a new l.p. feeder from Tavistock Place sub-station to Gordon Street and Gower Place (£1,974); and the substitution of a distributor cable of greater capacity in Gordon Square and Gordon Street (£176).

Lowestoft.—LOANS.—The Town Council has applied for sanction to a loan of £1,550 for supplying electricity to Carlton Colville village, where there are seventy-seven prospective consumers. Sanction to a loan of £5,000 for meters has been received.

STREET LIGHTING AT PAKEFIELD.—It has been agreed to supply electricity for street lighting at Pakefield at £3 15s. per annum per 100-watt lamp, and £3 per annum per 60-watt lamp.

Macclesfield.—PROPOSED SALE OF UNDERTAKING.—After considering the letter of the electricity company to the Electricity Commissioners with reference to the sale of the undertaking, the Corporation Electricity Committee has decided to reply that it will be agreeable to receive new terms from the company, but that the Committee is unanimously of the opinion that the undertaking should be municipally owned.

Malvern.—METER RENTS ABOLISHED.—The Urban District Council has decided to abolish meter rents for lighting and power.

Milngavie.—STREET LIGHTING.—The Street Lighting Committee has decided to light the following streets by electricity: North Campbell Avenue, Vivian Avenue, Barrhead Avenue, and the northern portion of Craigmiller Avenue.

Mold.—YEAR'S WORKING.—The operation of the Urban District Council's electricity undertaking for the past year resulted in a gross profit of £1,854, and a net profit of £508.

Montrose.—STREET LIGHTING.—The Town Council has adopted a scheme submitted by the North of Scotland Electric Light & Power Co., Ltd., for the improvement of the street lighting at a cost of approximately £1,000.

Newport (Salop).—INAUGURATION OF SUPPLY.—A supply of electricity was inaugurated on September 11th, the ceremony being performed by the chairman of the Urban District Coun-

cil, Mr. E. A. Evans, who was accompanied by several of the councillors. Representing the West Midlands Joint Electricity Authority were Alderman J. Bell (chairman), Mr. E. F. Heatherington (chief engineer), and Mr. H. F. Carpenter (clerk and treasurer). After the ceremony the party visited the termination of the main transmission line outside the town and inspected the new electrical installation at the Grammar School. Until the completion of the Authority's power station at Ironbridge, energy is being transmitted to Newport *via* Bridgnorth, Ironbridge and Wellington from the Stourport station of the Shropshire, Worcestershire and Staffordshire Electric Power Co. The supply is transmitted from Stourport to Ironbridge at a pressure of 33,000 V, and thence onwards at 11,000 V, although the transmission lines are designed to be ultimately put up to a working pressure of 33,000 V. Energy is transmitted from the termination of the main transmission line to two parts of the town by means of secondary 11,000 V lines, and at these points pole transformer stations have been established. Land has, however, been purchased at the terminal points of the secondary transmission lines for the construction of sub-stations as soon as the growth of business in the town justifies it. A supply of electricity was commenced in the town of Wellington (Salop) early this year, and the bringing of a supply to Newport marks a further advance in the carrying out of the Authority's first distribution scheme, which covers an area of approximately 108 sq. miles in Shropshire. It is anticipated that energy will be taken to Shifnal before the end of the year, while electricity will also be available during next year to a considerable number of villages in the rural areas around the three towns mentioned.

Oswestry.—SPECIAL ORDER.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Corporation to supply electricity in parts of the rural districts of Oswestry and Llanfyllin.

Padiham.—YEAR'S WORKING.—The year's working of the Padiham Urban District Council electricity undertaking disclosed a gross profit of £1,995, and a net profit of £475.

Parbold (Lancs).—INAUGURATION OF SUPPLY.—A supply of electricity, provided by the Lancashire Electric Power Co., has recently been inaugurated.

Portland.—NEW ELECTRICITY TARIFF.—The Urban District Council has adopted the "size-of-house" tariff for premises where electricity is used for cooking or heating, with a "unit" charge of 1¼d.

LOANS.—Sanction to loans of £500 each for hire purposes and assisted wiring is to be applied for.

Preston.—PRICE REDUCTIONS.—The Corporation Electricity Committee has decided to make the following reductions in electricity charges from October 1st. Lighting flat rate: from 6d. to 5½d. per kWh (outside the borough from 6½d. to 6d.). Ordinary power rate (exclusive of textile mills and cinemas): a reduction of 10 per cent. Meter rents are to be abolished.

Richmond (Yorks.).—PRICE REDUCTIONS.—The Town Council has reduced the charges for electricity for lighting from 6d. to 5d. per kWh, and for heating and power from 3d. to 2d. per kWh.

South Africa.—CAPE TOWN.—The loan programme of the City Council for the next three years—1932 to 1934—includes £500,000 for a power station, etc. The Council has approved the programme tentatively, and plans and estimates will be prepared with a view to the final adoption of the proposals.

Southend-on-Sea.—PROMENADE LIGHTING SCHEME ABANDONED.—Owing to the refusal of a grant towards the cost of laying h.p. mains along the Promenade, the Town Council has withdrawn its application for a loan. This will mean the abandonment of a scheme for improving the lighting of the sea front.

LOAN.—The Council has applied for a sanction to a loan of £3,200 for adapting the boiler-house at the London Road depôt for use as a meter-room, wireless repair-room, and mess-room.

Sunderland.—SUPPLY TO HARTON.—The first section of the electricity scheme from Sunderland to Harton is now completed, and will be put into operation shortly.

Taunton.—SUPPLY TO RURAL AREA.—The Town Council has adopted a comprehensive scheme, prepared by the borough electrical engineer, for supplying electricity in the rural area, which includes the villages of Stoke St. Mary, Hatch Beauchamp, North Curry, Durston, Pitminster, and Blagdon. The estimated cost of the scheme is £15,000, for which sum a loan is to be applied for, and also a grant from the Unemployment Grants Committee.

Watford.—YEAR'S WORKING.—The accounts of the Corporation Electricity Department (chief engineer and general manager: Mr. A. W. Barham) for the year ended March 31st last reveal a total revenue of £164,630 and a working expenditure of £82,871. There was a gross profit of £81,759, to which was added an unemployment grant, bank interest and sinking fund interest, making a total of £83,620 available. Interest on loans, loan repayment and sinking fund contributions absorbed £50,255, and there was a net surplus of £33,365. During the year £51,746 was spent on capital account, the total capital expenditure now being £756,851. Sales of electricity advanced from 23,752,994 to 30,456,030 kWh and the maximum demand from 9,400 to 10,850 kW. The average price obtained per kWh, after providing for cash discount and other allowances was 1.19d., as compared with 1.27d. in the previous year. The number of consumers increased from 11,948 to 13,198, very satisfactory results being obtained from the assisted wiring scheme. A considerable amount of work, costing in all some £20,000, was carried out during the year in connection with the laying of the h.p. and l.p. mains.

Wellington.—OVERHEAD LINES INQUIRY.—Mr. F. Gordon Tucker, an inspector appointed by the Ministry of Transport, conducted an inquiry at Wellington last week into objections raised by the Urban District Council against the proposal of the West Midland Joint Electricity Authority to erect overhead cables from the Buck's Head, Wellington, to Shrewsbury. The Council desired that underground cables should be laid from the Buck's Head to Chuddely Lane. Ultimately the electricity authority agreed to lay the cables underground from the Buck's Head to Agate Road.

Wick.—ELECTRICAL ACTIVITY.—The Town Council has decided to apply for sanction to the borrowing of £2,000 for wiring, and £450 for the conversion of street lamps to electricity.

Traction

Continental.—GERMANY.—It is proposed to extend the system of electric railways in the South of Germany with a view to the better utilisation of the hydro-electric power available. Before this work is carried out it is intended to renew the permanent way on long sections of line, because it has been found in the case of certain sections of the lines already electrically operated that the rails are insufficiently strong to bear the weight of the heavy electric locomotives at high speeds.

Manchester.—PROPOSED CO-ORDINATION WITH SALFORD.—The Corporation Transport Committee reports that no satisfactory arrangement can be made with the Salford Corporation for the co-ordination of the transport undertakings.

Middlesbrough.—PROTECTION OF TRAMWAY UNDERTAKINGS.—At a recent meeting of the Northern Area Traffic Commissioners, Mr. Henry Riches, the chairman, outlined the policy decided upon regarding the protection of tramway undertakings. Where 'bus services coincided with an efficiently worked tramway undertaking, higher fares would be charged on the 'buses, and similar protection would be afforded to trolley 'bus services and public service vehicles substituted for trams, provided that fares were not unreasonably high. These higher fares would not operate where persons were travelling to and from places beyond the tramway route.

Preston.—TRANSPORT QUESTION DEFERRED.—After considering the type of vehicle to be used on the Farringdon Park-Penwortham route—trolley 'buses, petrol motor 'buses, or compression-ignition 'buses—the Corporation Transport Committee has deferred the question for three months.

Stalybridge.—YEAR'S WORKING.—There was a decrease of £18,700 in the income of the transport undertaking of the Stalybridge, Hyde, Mossley, and Dukinfield Tramways and Electricity Board for the past year, the total revenue amounting to £120,319. There was a fall of 509,257 in the total number of passengers carried by the trams and 'buses, while the decrease in tramway passengers was 2,370,452.

Warrington.—'BUSES REPLACE TRAMS.—As the result of the sanction granted by the Traffic Commissioners at Chester to the Warrington Corporation to run a 'bus service to Stockton Heath, the tramcars are now being replaced by 'buses.

Telegraph and Telephone

Honduras.—STATE TELEPHONE SYSTEM.—The Government has placed an order for complete telephone plant for State use of the latest rotary automatic type. The switching equipment will have an ultimate capacity of 4,000 lines and an immediate capacity of 1,000 lines. Both aerial and underground cables will be used, and the installation is expected to be completed early in the new year.—*Reuter's Trade Service* (Tegucicalpa).

International Telephony.—ANGLO-TURKISH SERVICE.—The Turkish Postmaster-General has spoken to London telephonically and it now only remains to fix the charge for conversations before a service between Constantinople and London is opened to the public.

Sweden.—TELEPHONE JUBILEE.—On September 1st the State Telephone Department celebrated the 50th anniversary of the opening of the public service in Sweden, although the manufacture of instruments began in Sweden as long ago as 1877. Count H. A. Hamilton, director-general of the Swedish Telephone and Telegraph Department, states that there are at present about 534,000 telephones, or roughly one per eleven inhabitants, and over 4,000 exchanges in Sweden. The total length of lines is about 966,000 kilometres, and the capital invested amounts to 300 million kronor (£16,666,667). During the past year 791 million calls, or about 131 calls per inhabitant, were registered. Technical development continues, especially as regards automatic exchanges, which have almost replaced manually-operated types in Stockholm and many other towns. The ultimate aim is to install automatic ex-

changes throughout the entire Swedish system. The well-known L. M. Ericsson automatic exchanges are being used for this purpose. Sweden's international connections have now been extended so as to reach most parts of the world, including North and South America.

Switzerland.—TELEPHONY.—While a steady decline continues to take place in the receipts of the telegraph system, those of the telephone service continue to make rapid progress. Thus, during the first half of the present year no fewer than 6,686 new subscribers were secured, bringing up the total to 221,821.

U.S.A.—POLICE RADIO.—New York City's police chief, Mr. E. P. Mulrooney, has asked for £20,000 to equip a number of police cars, police boats, and police aeroplanes with short-wave radio sets, and to establish three police transmitters. "The use of short-wave radio communication has been shown to be a success in more than twenty-five American cities," says Mr. Mulrooney. It will be possible to have the receiving sets permanently tuned and locked to pick up only the wave-length of the new police sending stations. Announcements directed toward them exclusively can be so "scrambled" as to prevent them from being interpreted by another receiving set not so adjusted.

Radio

Austria.—PROPOSED NEW STATION.—It was stated at the opening meeting this season of the Ravag Council that the number of subscribers on September 6th was 451,023. Director-General Czeija announced that the provision of a new transmitting station was urgent, as Prague and Brno, both near neighbours, would soon be working with 100 kW and Bratislava with 35 kW.

B.B.C.—FINANCE.—The Chancellor of the Exchequer has told the House of Commons that the British Broadcasting Corporation has agreed to forgo out of its total revenue from licences a sum of £50,000 for the period ending next March and £150,000 in a full financial year. As a result of this arrangement it was estimated that the Exchequer would receive in the current financial year £646,166 out of a total licence revenue of £2,000,000; and next year £775,000 out of a total of £2,250,000. In addition, 10 per cent. of the total revenue would be retained by the Post Office in respect of the cost of collection, so that out of a total wireless revenue next year of £2,250,000 the Exchequer would receive one million.

LICENCES.—It is estimated that there are 400,000 unlicensed receiving sets in use in London, which means a loss to the Post Office of £200,000 a year. On October 1st a round-up of "pirates" is to begin. Since the British Broadcasting Corporation came into existence there have been over 6,000 prosecutions. In London, from August, 1930, to July, 1931, there were 269 prosecutions and 268 convictions.

NEW STATION.—It is understood that the site for the new western regional broadcasting station will be at Washford Cross, West Somerset, close to Watchet.

U.S.A.—RECEIVING SETS.—The Electrical Equipment Division of the Department of Commerce in Washington estimates, from figures which it has lately compiled, that there are 10,500,000 receiving sets in the United States. The total in the North American continent is stated to be 10,927,888 sets, of which Canada has 284,580.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—VICTORIAN ELECTRICITY COMMISSION.—November 16th. Aluminium steel cored cable. (September 4th.)
October 20th. Postmaster-General's Department. Supply and delivery of testing instruments. Specifications, &c., from the High Commissioner, Australia House, London.—*Tenders.*
October 27th. Loading coil pots. Specifications, &c., from the High Commissioner, Australia House, London.—*Tenders.*

Belgium.—BRUSSELS.—October 7th. Telephone and Telegraph Administration. Telephone cables and accessories for the Ostend district. Particulars (Cahier des Charges Spécial No. 3,587) for 3.80 francs from the offices of the Administration, La Salle Madeleine, Brussels.
October 7th.—Société Nationale des Chemins-de-Fer Belges. Fifteen electric welding sets (50-cycle a.c.). Particulars (Cahier des Charges) from Service du Matériel, Division des Achats, Bureau 26-5, 21, Rue de Louvain, Brussels.

Derby.—October 5th. Tramway and Omnibus Department. Supply and erection of approximately 3½ miles of trolley-omnibus overhead lines. (September 11th.)

Egypt.—CAIRO.—October 8th. Prison Administration. Diesel engine driven generator for Abu Zaabal power station. (A.X. 11055.)*
October 28th. Department of Public Health. Electro-medical and X-ray apparatus for six months commencing November next. (A.X. 11069.)*
December 2nd. Ministry of the Interior. Complete power station for the town of Tantah. (A.X. 11066.)*
October 12th. Ministry of Public Works. Three-core cable for Atf pumping station. (A.X. 11109.)*

Great Western Railway.—October 1st. Telegraph instruments, electrical apparatus, &c. (September 18th.)

Grimsby.—October 2nd. Electricity Department. L.p. cables, (See this issue.)

Irish Free State.—DUBLIN.—September 29th. Office of Public Works. Electrical works and supplies required in the Dublin district for alternative periods of one and three years commencing October 6th, 1931. Particulars (deposit £1 1s.) from Mr. J. Cassidy, secretary.

Keighley.—September 28th. West Riding Public Assistance Committee. Installation of an electric bed lift at the County Hospital. Specification and form of tender from Mr. P. O. Platts, West Riding architect, County Hall, Wakefield.

London.—SOUTHWARK.—October 21st. Borough Council. Cable. (September 11th.)
ISLINGTON.—October 2nd. Borough Council. Two lead batteries, &c. (See this issue.)

Manchester.—October 12th. Waterworks Committee. Four electrically driven centrifugal pumps, with switchgear, pipes, valves, &c., at Lostock booster station. Specifications (deposit £2 2s.) from the waterworks engineer, Waterworks Offices, Town Hall.

Marple.—October 10th. Electricity Department. Wiring for electric lighting and power installations, to be carried out under an assisted wiring scheme. Specifications (deposit £1) and form of tender from Mr. J. K. Law, electricity manager, Council Offices.

Muirkirk.—Baird Institute. Installation of generating plant. Particulars from Mr. J. Anderson, secretary, 166, Albert Place.

New Zealand.—WELLINGTON.—November 19th. New Zealand Railways. Intercall telephone system between Christchurch and Invercargill. (A. 11060.)*
February 29th. Three automatic railway sub-stations (A.X. 11105.)*
Public Works Department. November 17th. Four 3,333-kVA oil-immersed self-cooled transformers. (A.X. 11079.)*
December 15th. 270 galvanised steel transmission line towers, complete with arms, ground stubs, and accessories. (G.X. 10703.)*
November 10th. Post and Telegraph Department. 5,650 condensers. (A.X. 11101.)* and 2,300 lamp caps (A.X. 11102)*
November 11th. Twelve time delay relays. (A.X. 11103.)*
November 17th. Resistance spools. (A.X. 11104.)*
INVERCARGILL.—October 28th. City Council. Centrifugal low-lift pumping plant, including motor and control gear. (G.X. 10738.)*

South Africa.—CAPE TOWN.—October 14th. Electricity Department. Street-lighting fittings. (G.X. 10733.)*
JOHANNESBURG.—October 22nd. City Council. Twenty 50 h.p. tramcar motors. (A.X. 11107.)*

Wolverhampton.—October 13th. Corporation. Four sets of sludge pumps of the treble-ram, two-barrel, double-acting type driven by electric motors. Also one electrically driven centrifugal pump. Specifications and form of tender (deposit £2) from Messrs. Dodd & Watson, Wellington House, Bennetts Hill, Birmingham.

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Barnard Castle.—Durham Assistance Committee. Accepted:—
Electric lighting at Poor Law institution (£184).—Kelly & Co.
Recommended:—
Electric lighting at Crook Committee offices.—J. Hinchley & Sons.

Campden.—Rural District Council. Accepted:—
Installation of electric lighting at houses at Catbrook Broad Campden and Weston Subedge (£87).—H. C. Dillworth.

Glasgow.—Corporation Electricity Committee. Recommended:—
Lighting fittings required in the reconstructed premises of the Department in Waterloo Street.—Holophane, Ltd. (£625); General Electric Co., Ltd. (£727); J. Donnachie (£110).
Education Committee. Accepted:—
Electric lighting at Garscadden School (£283).—D. Henderson.

Government Contracts.—The following contracts were placed by the various Government Departments during August:—
ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).
Dry batteries.—Siemens Bros. & Co., Ltd.
Electric cable.—Hooper's Telegraph & India Rubber Works, Ltd.
W/t condensers.—British Insulated Cables, Ltd.
Electrodes.—Quasi-Arc Co., Ltd.
Motor generators.—Mawdsleys, Ltd.
Motor-driven pumping sets.—Sturtevant Engineering Co., Ltd.

E.h.p. switchgear.—Ferguson, Pailin, Ltd.
Testing equipments.—Metropolitan-Vickers Electrical Co., Ltd.

WAR OFFICE.
Electric cable.—Hackbridge Cable Co., Ltd.; Union Cable Co., Ltd.
Generating set and spares.—Petters, Ltd.

AIR MINISTRY.
Accumulators.—Peto and Radford; Oldham and Sons, Ltd.
Controllers.—Engineering and Lighting Equipment Co., Ltd.
Transmitters.—Gambrell Bros., Ltd.
Transmitter - receiver.—Marconi's Wireless Telegraph Co., Ltd.

CROWN AGENTS FOR THE COLONIES.
Cable boxes.—Siemens Bros. and Co., Ltd.
Electrical equipment.—T. Smith and Sons (Rodley), Ltd.
Electrical materials.—Chloride Electrical Storage Co., Ltd.
Electric generator.—Belliss and Morcom, Ltd.
Telephone materials.—General Electric Co., Ltd.
Train lighting material.—J. Stone and Co., Ltd.

POST OFFICE.
Telephonic apparatus.—General Electric Co., Ltd.; Siemens Bros. and Co., Ltd.; Telephone Manufacturing Co. (1929), Ltd.
Testing and protective apparatus.—Automatic Telephone Manufacturing Co., Ltd.; Phoenix Telephone and Electric Works, Ltd.
Telephone cabinets.—Boulton and Paul, Ltd.; Siemens Bros. and Co., Ltd.
Cable.—British Insulated Cables, Ltd.; Connollys (Blackley), Ltd.; Hackbridge Cable Co., Ltd.; Pirelli-General Cable Works, Ltd.; Standard Telephones and Cables, Ltd.
Submarine cable.—Siemens Bros. and Co., Ltd.; Telegraph Construction and Maintenance Co., Ltd.
Secondary cells.—Accumulators of Woking (1923), Ltd.; Alton Battery Co., Ltd.; D.P. Battery Co., Ltd.; Oldham and Son, Ltd.
Loading coils.—Siemens Bros. and Co., Ltd.; Standard Telephones and Cables, Ltd.
Telephone cords.—British Insulated Cables, Ltd.; L.P.S. Electrical Co., Ltd.; Reliance Electrical Wire Co.; Siemens Bros. and Co., Ltd.
Electric light fittings.—Hailwood and Ackroyd, Ltd.
Insulators.—Thos. De La Rue and Co., Ltd.; Doulton and Co., Ltd.; Litholite Insulators, Ltd.; Taylor Tunnicliff and Co., Ltd.
Electric lamps.—British Electric Transformer Co., Ltd.; British Thomson-Houston Co., Ltd.; Cryselco, Ltd.; Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.; Siemens Electric Lamps and Supplies, Ltd.; Stella Lamp Co., Ltd.
Electric lamps for postmen.—Ever Ready Co. (Great Britain), Ltd.
Electric motors.—Creed and Co., Ltd.
Earth plates.—Bullers, Ltd.
Rectifiers.—Edison Swan Electric Co., Ltd.
Insulating tape.—W. T. Henley's Telegraph Works Co., Ltd.
Electric goods lift, Hastings (Railway Station) Post Office, sorting office.—Evans Lifts, Ltd.
Electric lighting, money order office extension (Holloway).—G. E. Taylor and Co.
Rectifiers and transformers, money order office (Holloway).—Hewittic Electric Co., Ltd.
Telephone exchange equipment.—Southend-on-Sea Borough Electricity Department: Relay Automatic Telephone Co., Ltd.; A. Lee and Sons (Sheffield); Amherst (London, S.E.); Primrose (London, N.W.); Bishopsgate (London, E.); Monument (London, E.C.); Metropolitan and National (London, E.C.); Hendon (London, N.W.); Hillside (London, N.); Portsmouth; Southport Multi-office area; Holborn (London, W.C.); Preston (Torquay automatic area); Bishopsgate tandem (London director area): Automatic Telephone Co., Ltd. (Sub-contractors for Bishopsgate tandem: Chloride Electrical Storage Co., Ltd., for batteries). Pollards (London, S.W.); Livingstone (London, S.E.); Mitcham; Gulliver (London, S.W.); Addiscombe; Beckenham; Whitehall; Ilford; Western (London, W.); Sutton Coldfield (Birmingham); Four Oaks (Birmingham); Maida Vale (London, W.); Brighton Central (Brighton Multi-Exchange Area): Siemens Bros. and Co., Ltd. (Sub-contractors for Brighton Central: Hart Accumulator Co., Ltd., for batteries). Broadwell (Birmingham Area): Siemens Bros. and Co., Ltd. (Sub-contractors: Chloride Electrical Storage Co., Ltd. for batteries; Electric Construction Co., Ltd., for charging machine; Crompton Parkinson, Ltd., for ringing machines). Hampstead (London, N.W.); Gladstone (London, N.W.); Shepherd's Bush (London, W.); Stechford, Priory, Tipton (Birmingham Area); Ericsson Telephones, Ltd. (Sub-contractors for Tipton: Hart Accumulator Co., Ltd., for batteries; Electric Construction Co., Ltd., for motor generator sets and ringing machines). Preston, Fulwood, Leyland and Ashton-on-Ribble (Preston, Observation Area); Watford; Archway (London, N.); Reliance (London, S.E.); Leytonstone (London, E.); Fairfield (Croydon); Flaxman (London, S.W.); Macaulay (London, S.W.); Edgware; Park; Dundee (Dundee Multi-Exchange Area); Epsom: General Electric Co., Ltd. (Sub-contractors for Park and Epsom: D.P. Battery Co., Ltd., for batteries; Crompton Parkinson, Ltd., for charging and ringing machines).
Telephonic repeater equipment (Metropolitan Telephone Exchange, London, E.C.).—Standard Telephones and Cables, Ltd.

Kirkcaldy.—Town Council. Accepted:—
Electrical work at Corporation housing scheme.—Rolland & Co.

Lichfield.—City Council. Accepted:—
Installation of electric lighting at houses at Dovehouse Fields (£80).—J. W. Richards.

London (ISLINGTON). — Electricity Committee. Recommended:—
Switchgear maintenance for a further period of two years (£145 per annum).—Metropolitan-Vickers Electrical Co., Ltd.

ST. PANCRAS.—Contracts and Stores Committee. Recommended:—
Wiring and fitting flats: Culcross Buildings and Stalbridge House (£256), Service Electric Co., Ltd.; Stanley Buildings (£380), T. H. Smerdon; Pancras Square (£405), W. G. Bailey.

HAMMERSMITH.—Electricity Committee. Recommended:—
Provision of modern metal-clad 3-phase e.h.p. and 2-phase h.p. switchgear at Wood Lane sub-station (£2,637). Two 200 kW. air-cooled transformers (£350).—British Electric Transformer Co., Ltd.

Manchester.—Education Committee. Accepted:—
Alterations and additions to the electrical installations at the Cheetham senior school.—W. A. Shaw & Co.

Montrose.—Town Council. Accepted:—
Electric lighting work at housing scheme (£138).—J. B. Beveridge.

Whitburn.—Town Council. Accepted:—
Electric lighting work at new housing scheme (£198).—D. Henderson.

Forthcoming Events

National Radio Exhibition.—September 18th-26th. Olympia.

Association of Supervising Electrical Engineers.—September 26th-27th. National conference, &c., with official visit to the Faraday Electrical Exhibition, Royal Albert Hall, London.

Electroplaters' & Depositors' Technical Society.—Friday, September 25th, Rehearsal Room, Albert Hall, London, Faraday Centenary Celebrations, 3.30 p.m. "The Rise and Early Development of Electroplating," by Dr. R. S. Hutton. 7.30 p.m. "Electrodeposition and the Engineer," by D. J. Macnaughtan.

Electrical Association for Women.—Saturday, September 26th. Visit to Shipping, Engineering and Machinery Exhibition, Olympia. Monday, September 28th. 3.30 p.m. Visit to Faraday Exhibition.

British Association.—September 23rd-30th. South Kensington, S.W. Centenary meeting.

Women's Engineering Society.—September 25th-28th. Crosby Hall, Cheyne Walk, S.W. Annual conference.

Electric Lodge No. 2087.—Saturday, September 26th. Café Royal, Regent Street, W. Address on the Life of Faraday by W. Bro. Michael Faraday.

Electrical Power Engineers' Association.—September 26th, Holborn Restaurant, W.C. Annual dinner.

Iron and Steel Institute.—September 29th-October 1st, Swansea. Autumn meeting.

Birmingham Electric Club.—Friday, September 25th, Grand Hotel, Birmingham, 7 p.m. Short papers.

Our Service Department

Enquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the name and address of the makers of the following:—

MORCOPHANE ceiling fittings.
SERTT lampholder.
MARBLEOID, LUMINAQUE and VETROLOID material for lamp shades.
Watertight lampholders, ⅜ in. conduits, with shade carrier rings.
Wire frames for lamp shades.

Vargön Power Station, Sweden

The Vargön power station (head 14.1 ft.) on the Gotha River in Sweden has been proceeded with in natural sequence after the two other important projects of Trollhättan (medium head, of 103.5 ft.) and Lilla Edet (low head plant, 21.3 ft.) also on the Gotha River. With these three stations in service, practically the whole of the power which can be derived from the energy stored in Lake Vener will be harnessed. The Vargön station is to be automatically controlled without any regular attendants. The generators will be of the open-air type, which, although a fairly common arrangement in the United States, is a new departure for Europe. Further, the turbine runners (26 ft. 3 in. diameter), of the Kaplan type with blades adjustable during running, will be the largest in the world. The diameter of the runners of the Kaplan turbines with the largest output yet built, namely, the 39,700 h.p. set at Ryburg (Switzerland) and the 37,500 h.p. set at Swir (Russia) are 22 ft. 11½ in. and 24 ft. 4 in. respectively.

Each of the two turbines in the station is being designed to operate under a normal net head of 14.1 ft. and to develop 15,200 h.p., at 46.9 r.p.m., with a water consumption of 11,100 cusecs.

The order for one complete turbine has been placed by the Swedish Royal Waterfall Board with the Swedish associates of Messrs. Boving & Co., Ltd., namely, Aktiebolaget Karlstads Mekaniska Verkstad, Verkstaden, Kristinehamn. For the other turbine the runner has also been ordered from Verkstaden, Kristinehamn, who are responsible for the output and efficiency guarantees for this as well, while the remaining parts of the machine are being manufactured by Nydquist & Holm, of Trollhättan, Sweden.

Notes

Educational

SCHOOL OF ENGINEERING AND NAVIGATION, High Street, Poplar.—Since last session a new wing has been added, comprising laboratories, a foundry, an extension to the electrical laboratory, shops for electric and oxy-acetylene welding, and additional classrooms and drawing offices, etc.

UNIVERSITY OF LONDON.—A course of five lectures on "The measurement of light: its basis and its significance" will be given at the Institution of Electrical Engineers, Victoria Embankment, W.C.2, by Mr. E. C. Crittenden on October 16th, 21st, 23rd, 26th and 28th. Admission will be free, without ticket.

The International Electrotechnical Commission

To the number of anniversary celebrations this year must be added that of the twenty-fifth year from its foundation of the International Electrotechnical Commission. The occasion was commemorated by a dinner given last Friday by the President, Dr. Axel F. Enström, at the Dorchester Hotel, London, W. The first president of the I.E.C. was Lord Kelvin, who served in 1906, and the list of past presidents includes the names of engineers of the highest eminence in all countries. Lt.-Col. K. Edgcumbe has been honorary secretary since 1927 and Mr. C. le Maistre, C.B.E., F.C.G.I., is general secretary. The English committee of the I.E.C. is provided by the British Engineering Standards Association.

Dr. Enström, speaking first in French and then in English, welcomed his guests, and referring to the genesis of the I.E.C. in a meeting at St. Louis in 1904, said that six of those who attended that meeting were present at the dinner. (This is referred to more fully in our "Personal" columns.) Col. Crompton, he said, was the originator and keen promoter of the idea of the standardisation of machinery, and its subsequent success had been due, more than anything else, to the indefatigable work, patience, and diplomacy of Mr. le Maistre.

Col. R. E. Crompton, C.B., followed with some amusing reminiscences of his career. He thought the greatest value of the I.E.C. lay in the promotion of international friendships. Regarding rural electrification, he said that there was a danger of regarding it too much from the urban industrial point of view, but the E.A.W. was a most important electrical missionary. After a brief speech by Mr. Brylinski in French, Prof. Elihu Thomson added his reminiscences, which included the first example of electric welding and an account of how transformation of voltage was made safe for the consumer in 1887 by the earthing of the secondary winding. He showed the company a photograph he had just received of a fused quartz astronomical mirror, 64 in. in diameter, and 12 in. thick. The importance of this achievement lies in the fact that the co-efficient of expansion is only one-fifteenth that of glass.

Prof. C. Feldmann, Dr. Kennelly, Prof. Lombardi, Mr. Ll. B. Atkinson, and Mr. le Maistre also spoke in happy vein.

Presentations were made by Dr. Enström to Messrs. Crompton, le Maistre, and C. O. Mailloux (who was unable to be present) of silver plaques, engraved with the autographs of all the national committee chairmen.

Midland Engineers' Ball Cancelled

The organising committee has unanimously decided, in view of the present national economic conditions, that the Midland Electrical Engineers' Ball shall not take place this year.

Smoke Abatement Conference

Municipal authorities in fifty cities and towns sent delegates to the annual conference of the National Smoke Abatement Society which was held at Liverpool from September 18th to September 20th. Prominent personalities in the gas and electrical industries, doctors and members of workers' organisations, also attended. The Lord Mayor of Liverpool (Alderman Edwin Thompson) held a reception for the delegates at the Town Hall on September 18th. Among the more important papers read was one by Mr. Robert Blackmore, of the Central Electricity Board, who described the national grid scheme in full operation. There was also an exhibition of apparatus (loaned by the Department of Scientific and Industrial Research and other bodies) used for measuring impurities in the atmosphere.

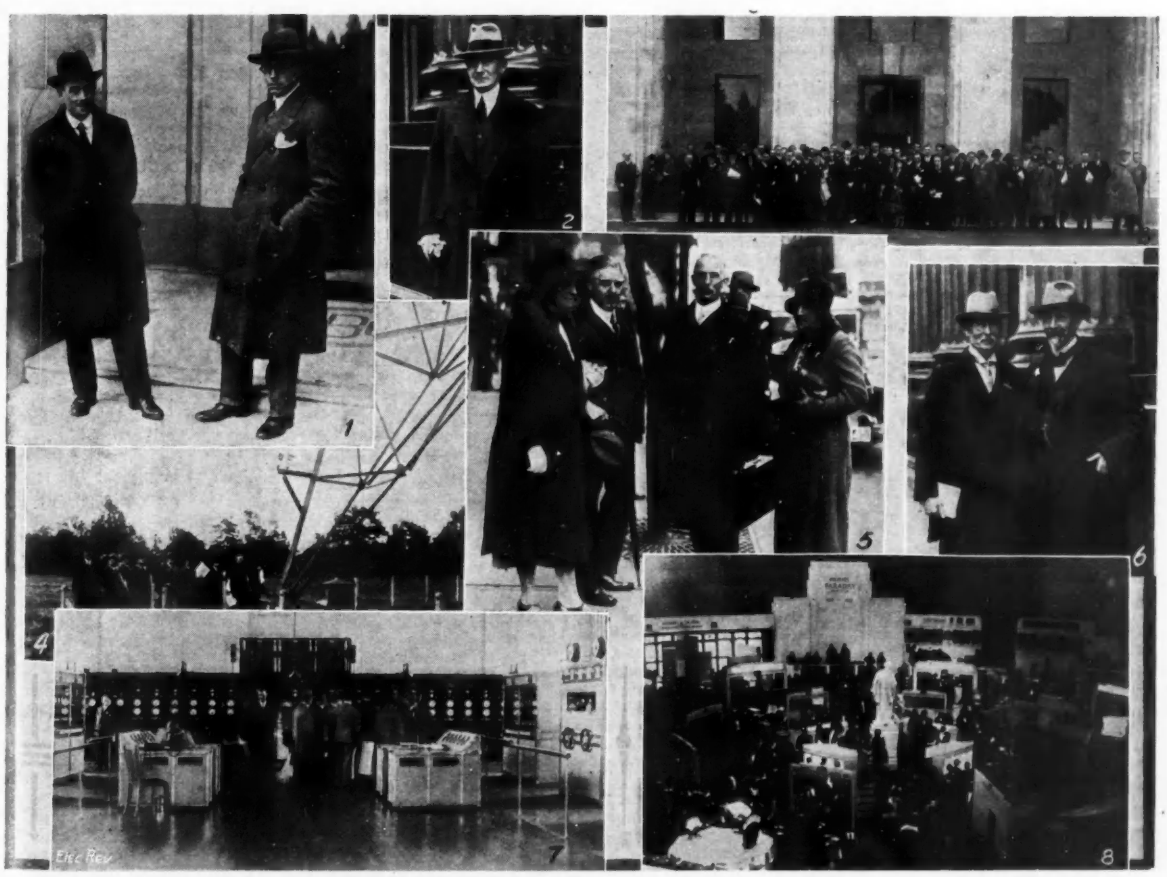
Electricity Generated in August in the U.S.A.

In our last issue (p. 443) we reported the figures relating to electricity generated in Great Britain last August. These showed that the number of kWh generated had increased by 5 per cent. over the corresponding period in 1930. In the U.S.A. returns from 92 per cent. of the supply undertakings show that the kWh generated between August 1st to 29th amounted to 8,197 million kWh, a decrease of about 2.7 per cent. from last year's figures.

Appointment Vacant

Chief electrical engineer and manager for the St. Pancras Borough Council.

(See our advertisement pages to-day.)



Photographs taken at Brookmans Park and elsewhere: 1, Messrs. N. Ashbridge and E. Diverio; 2, The Marchese Marconi; 3, Outside the broadcasting station; 4, At the base of an aerial mast; 5, Capt. and Mrs. P. Dunsheath; 6, Mr. Ll. B. Atkinson and Dr. August Hagenbach; 7, In the control room; 8, I.E.E. members at the Albert Hall.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

On page 455 we review the speeches at the Faraday commemorative meeting, held on Monday last at Queen's Hall. The following notes on the speakers may be of interest to our readers:—

M. le Duc de Broglie is a leader of scientific research in France. He has made a number of valuable researches in his private laboratory in Paris. The best known are his pioneer investigations on X-ray spectra. For this and other work he was awarded the Hughes Medal of the Royal Society in 1928.

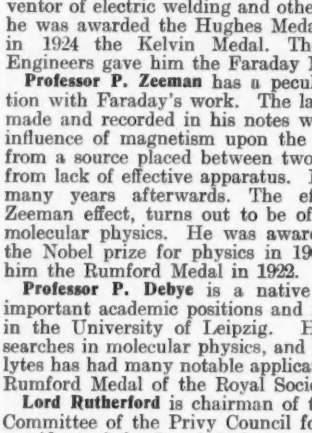
The Marchese Marconi took out his first patent for radio-telegraphy in June, 1896. He transmitted messages from England to France in 1899, and from Britain to America in 1901. In 1916 he began his experiments on short-wave telegraphy, making use of its directive properties. He was awarded a Nobel prize for physics in 1909 and the Royal Society of Arts has given him the Albert Medal.

Dr. Elihu Thomson was born in Manchester in 1853, but has spent almost the whole of his life in the United States. Since 1880 he has been associated with the Thomson-Houston and the General Electric Companies of America. He was the inventor of electric welding and other electrical devices. In 1916 he was awarded the Hughes Medal of the Royal Society, and in 1924 the Kelvin Medal. The Institution of Electrical Engineers gave him the Faraday Medal in 1927.

Professor P. Zeeman has a peculiar and interesting connection with Faraday's work. The last experiment that Faraday made and recorded in his notes was an attempt to find some influence of magnetism upon the nature of the light issuing from a source placed between two magnetic poles. He failed from lack of effective apparatus. Professor Zeeman succeeded many years afterwards. The effect, now known as the Zeeman effect, turns out to be of the highest importance to molecular physics. He was awarded—with H. A. Lorentz—the Nobel prize for physics in 1902; the Royal Society gave him the Rumford Medal in 1922.

Professor P. Debye is a native of Holland; he has filled important academic positions and is now Professor of Physics in the University of Leipzig. He has made important researches in molecular physics, and his theory of strong electrolytes has had many notable applications. He was awarded the Rumford Medal of the Royal Society in 1930.

Lord Rutherford is chairman of the Advisory Council of the Committee of the Privy Council for Scientific Research, past-president of the Royal Society and of the British Association. He became a Fellow of the Royal Society in 1903, was knighted in 1914, and received the Order of Merit in 1925. A barony was conferred upon him at the beginning of the present year.



Dr. Axel Enström, President of the International Electro-technical Commission

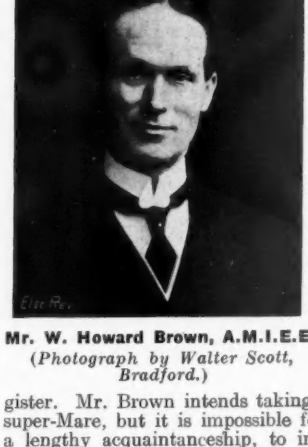
Dr. Axel F. Enström, whose portrait appears herewith, is president of the International Electro-technical Commission. He occupies the position in Sweden of Director of the Royal Institution of Scientific and Industrial Research. A fluent speaker in several languages, Dr. Enström has travelled widely, and is held in high regard in the various countries represented on the Commission. He was one of the group of six men who met in St. Louis in 1904 to discuss the formation of an international body to codify electro-technical practice and procedure. The others were Col. R. E. Crompton, Dr. Kennelly, Professor Elihu Thomson, Dr. Feldmann, and Mr. C. le Maistre. The outcome of this meeting was the formation of the I.E.C. in 1906.

Mr. le Maistre, C.B.E., F.C.G.I., has been general secretary of the Commission since its inception. He is also director of the British Engineering Standards Association, which, incidentally, provides the English Committee of the I.E.C. At the twenty-fifth anniversary dinner, which we report elsewhere, he was one of the recipients of a silver plaque on which were engraved the autographs of all the chairmen of the national committees of the Commission.

Monsieur J. A. d'Arsonval, the well-known French electrical engineer and scientist, has been awarded the Grand Croix of the French Legion of Honour.

Mr. R. W. Edwards, chairman and managing director of the Mid-Southern District Utility Co., who has been Mayor of Aldershot for the past two years, has again been nominated Mayor-elect for a third year.

Mr. O. G. Cook, electrical engineer and manager to the Barnoldswick Urban District Council, has been appointed as electrical engineer and manager to the Bingley Urban District Council in succession to Mr. P. Clegg, B.Sc., who has taken up duties as electrical engineer and manager to the Haslingden Corporation. Mr. Cook has previously held appointments with the Morecambe Corporation, Lancaster Corporation, H.M. Government, and also with the British Westinghouse Co.



Mr. W. Howard Brown, A.M.I.E.E. (*Photograph by Walter Scott, Bradford.*)

Mr. W. Howard Brown, A.M.I.E.E., electrical engineer to the Bradford Dyers' Association, Ltd., is retiring on the 30th instant after nineteen years' service. Previous to joining the B.D.A., Ltd., he was with the Associated Portland Cement Manufacturers, Ltd., of London and Gravesend. Mr. Brown was for several years on the Committee of the North Midland Centre of the I.E.E., and held the office of local hon. treasurer of the Benevolent Fund. He also represented the Institution on the Bradford Local Advisory Committee of the National Electrical Contractors' Register. Mr. Brown intends taking up residence near Weston-super-Mare, but it is impossible for us, after the privilege of a lengthy acquaintanceship, to imagine so active a man in retirement—as that term is often understood. We wish Mr. Howard Brown every happiness as he tries to take a more detached interest in events in the electrical world.

Mr. H. G. Burrows, formerly sales director of the Record Engineering Co., has joined the staff of the India Rubber, Gutta Percha & Telegraph Works Co., Ltd. (the Silvertown Co.), as marine representative for the British Isles.

Mr. Frank Thompson, general manager of the Christchurch tramways, New Zealand, who is now touring England with Mrs. Thompson, will leave for home *via* the United States, next month.

Mr. R. J. Walker, C.B.E., has been appointed chairman of the Parsons Marine Steam Turbine Co., Ltd., in succession to the late Mr. S. F. Prest. Mr. Walker has been vice-chairman and managing director of the company since March last. Prior to that date he was for 25 years joint managing director with the late Sir Charles Parsons.

Mr. D. Somers Brown, who has been connected with the Parsons Marine Steam Turbine Co., Ltd., at Wallsend-on-Tyne for thirty years, has been appointed engineering manager of the company.

Mr. W. Rollo, at present on the staff of Messrs. Balfour Beatty & Co., Ltd., has been appointed supervising engineer for the construction of a hydro-electric scheme in the northern district of Kenya Colony, East Africa.

Mr. A. F. Harmer, A.M.I.E.E., assistant electrical engineer (temporary), to Hammersmith Borough Council Electricity Department, has been appointed deputy borough electrical engineer and manager to the Council at a salary of £800, rising by increments of £25, to £900 per annum.

Mr. H. Breckell, on leaving to become electrical engineer with the Gainsborough Urban District Council, has been presented by his colleagues at Swinton with an inscribed grandmother clock.

Obituary

Mr. E. J. Turpitt.—The death occurred on Setember 15th, from injuries received whilst proceeding to his duties on a motor cycle, of Mr. Edward J. Turpitt, assistant engineer at the Newhaven generating station. Mr. Turpitt was 45 years of age.

Mr. C. Nickels.—The death took place on September 14th of Mr. C. Nickels, of Exton, near Exeter, who, about twenty-six years ago, introduced electricity to the parish. He at first generated at Exton Mills, and later fixed a turbine to replace the water wheel, and by this means he supplied the village residents. Later additional premises were provided, and recently the system was taken over by the Exe Valley Co.

Wills.—The late **Mr. T. H. U. Aldridge,** for many years electrical engineer and manager of the Shanghai municipal supply undertaking, left estate in England valued at £15,505.

Mr. H. Napier Prentice, who died on July 30th, left £1,128 (£1,086 net personalty).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Plug-in Wireless Exchange, Ltd.—Private company. Registered September 15th. Capital £6,000 in 5,000 10 per cent. cumulative preference shares of £1 each and 20,000 ordinary shares of 1s. each. Objects: To establish and maintain wireless signal stations, &c. The subscribers are: J. M. Thomas, 17, Loveday Road, West Ealing, W.13; Alice Thomas, 31, Wellesley Road, Clacton-on-Sea; H. Solomon, Beach Lea, Collingwood Road, Clacton-on-Sea; and J. F. Powell, 17, Loveday Road, West Ealing, W.13. J. F. Powell is managing director. Registered office: 17, Loveday Road, West Ealing, W.13.

Lamlite Signs Home Manufacturing Co., Ltd.—Private company. Registered September 18th. Capital £600 in £1 shares. Objects: To carry on the business of inventors, designers and manufacturers of and dealers in scintillating and other signs, signals and devices to be used for advertising goods and displaying announcements; electrical, mechanical and general engineers, &c. The subscribers (each with one share) are: H. L. Fry, 6, Elmwood Road, Monkseaton; and T. Lamb, "Woodlea," Forest Hall. The first directors are: H. L. Fry and others to be appointed by the subscribers.

"Fulgur" Electrical and Radio Co., Ltd.—Private company. Registered September 18th. Capital £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in radio and television sets, gramophones and automobile accessories, &c. The subscribers are: C. W. Redpath, "Imst," Cheam Common Road, Worcester Park, Surrey; and C. W. Israel, 42, Lewiston Place, Stamford Hill, N.16. The first directors are to be appointed by the subscribers. Registered office: 14-15, Coleman Street, E.C.2.

Redcar Radio Relays, Ltd.—Private company. Registered September 15th. Capital £500 in £1 shares. Objects: To carry on the business of distributors and relayers of radio, television or other programmes, radio engineers and manufacturers, &c. The first directors are G. T. Potts, 8, Hawthorne Road, Redcar; R. W. Benson, 71, Lumley Road, Redcar; M. R. Gill, 1, France Street, Redcar; and A. Chilton, 54, Lumley Road, Redcar.

A. B. Butt, Ltd.—Private company. Registered September 15th. Capital £3,000 in £1 shares (500 6 per cent. cumulative preference and 2,500 ordinary). Objects: To acquire the business of an electrical engineer, carried on by A. B. Butt, at Leicester, and to carry on the business of electricians and contractors, electrical, motor, telephone, heating, ventilating and general engineers, maintainers and repairers of and dealers in wireless instruments, &c. The permanent directors are A. B. Butt (governing director and chairman), Blaby Road, Enderby; and Miss M. Butt, Blaby Road, Enderby. Secretary: C. R. Thompson. Registered office: Queen Street, Leicester.

Universal Lighting Co., Ltd.—Private company. Registered September 16th. Capital £1,000 in £1 shares. Objects: To acquire the business of an electrical and wireless engineer carried on by F. W. Allum, at 7, High Street, Clacton-on-Sea, Essex, as the "Universal Lighting Co." The directors are: F. W. Allum and F. O. Allum, both of "Hazeley," The Grove, Clacton-on-Sea. Secretary: Miss Olive M. Stocker. Registered office: 7, High Street, Clacton-on-Sea, Essex.

Sky Illuminations, Ltd.—Private company. Registered September 16th. Capital £1,500 in 100 10 per cent. participating preference shares of £1 and 28,000 shares of 1s. each. Objects: To carry on the business of electricians, mechanical engineers and manufacturers, workers of and dealers in electricity, &c. The subscribers are: J. R. Geddes, 13, St. Petersburgh Place, Hyde Park, W.2; and A. W. Geddes, 38, Peel Street, W.8. Registered office: Craven House, Kingsway, W.C.2.

Castle Douglas Electric Supply Co., Ltd.—Private company. Registered September 12th in Edinburgh. Capital £5,000 in 250 ordinary and 250 6 per cent. preference shares of £10 each. Objects: To acquire the business of an electric lighting and power distributor, now carried on by H. D. Dobie, at 165 and 167, King Street, Castle Douglas. The directors are: H. D. Dobie, 14, Church Street, Castle Douglas; and J. A. Ferguson, Burrance of Courance, Lockerbie, Dumfries-shire. Registered office: Castle Douglas, Kirkcudbrightshire.

Ross (Wireless), Ltd.—Private company. Registered September 17th. Capital £500 in £1 shares. Objects: To carry on the business of manufacturers and repairers of and dealers in wireless apparatus, gramophones, gramophone records, television apparatus, &c. The directors are: N. Baker, 3, Bath Terrace, Gosforth, Northumberland; and H. B. Mason, 15, Salkeld Gardens, Gateshead. Secretary: N. Baker. Registered office: 199, Scotswood Road, Newcastle-on-Tyne.

Neolumin, Ltd.—Private company. Registered September 10th. Capital £25,000 in 12,500 8 per cent. cumulative participating preference shares of £1 each and 125,000 ordinary of 2s. each. Objects: To adopt an agreement with Luminous Road Guides Syndicate, Ltd., providing for the acquisition of the trade mark "Neolumin," and to carry on the business of roadmakers and manufacturers of materials connected therewith formerly carried on by the said Syndicate at 24, Holborn, W.C., and that manufacturers of luminous signs, indicators, cinema and theatre indicators, advertising devices, marine and mining equipment, switches, electrical and general engineers, electrical fitters, advertising contractors, &c. The subscribers are: R. J. Atkins, 22, Awlfield Avenue, Lordship Lane, N.17; and Maud K. Robinson, 29, Senrab Street, Stepney, E.1. The first directors are W. H. Burditt and J. Bickerton (life directors). Registered office: Raymond House, 32-34, Theobalds Road, W.C.1.

St. Mary's (Scilly) Electricity Supply Co., Ltd.—Private company. Registered September 14th. Capital £5,000 in £1 shares. Objects: To carry on the business of an electricity supply company in all its branches. The first directors are: A. H. W. Nance, The Parade, St. Mary's, Scilly Isles; C. R. St. John, Windsor House, Victoria Street, Westminster, S.W.; and A. R. Smith, Midland Bank Chambers, Exeter.

Mek-Elek Engineering, Ltd.—Private company. Registered September 10th. Capital £2,000 in £1 shares. Objects: To carry on the business of mechanical and electrical engineers, contractors, manufacturers, exporters and importers of, and dealers in, machinery and mechanical, electrical, and other devices, &c. The directors are: H. C. Cooper (managing director), Belmont, Lyme Regis, Dorset; and A. K. Whitburn, 49, Wellington Street, Strand, W.C.2. Secretary: A. K. Whitburn. Registered office: 57, Victoria Street, S.W.1.

Returns of Electrical Companies

Southern Brazil Electric Co., Ltd.—Trust deed dated September 1st, 1931 (supplemental to trust deed dated August 19th, 1914, and supplemental deeds, securing £750,000 6 per cent. mortgage debentures, and to trust deed dated August 15th, 1927, securing £200,000 7 per cent. prior lien debenture stock). Property charged: The benefit of an agreement dated September 7th, 1929, between the Municipal Council of Piracicaba and the company, with all its privileges, rights and advantages. Trustees: Metropolitan Trust Co., Ltd., Gresham House, E.C. (trustees for prior lien debenture stock); and Royal Exchange Assurance, Royal Exchange, E.C. (trustees for 6 per cent. mortgage debentures).

Kensington & Knightsbridge Electric Lighting Co., Ltd.—Capital £500,000 in 10,000 first preference and 10,000 second preference shares of £5 each and 400,000 ordinary shares of £1. Return dated March 26th, 1931. 10,000 first preference, 10,000 second preference, and 317,500 ordinary shares taken up. £179,840 paid on the first and second preference and 79,840 ordinary shares. £237,660 considered as paid on 237,660 ordinary shares. Mortgages and charges, £140,000; ditto guaranteed by this company and the Notting Hill Electric Lighting Co., Ltd., under powers of the Kensington and Notting Hill Electric Lighting Co.'s Act, 1899, £200,000.

Power Wireless, Ltd.—Capital £2,000 in 1,000 preference and 1,000 ordinary shares of £1. Return dated December 31st, 1930 (filed April 24th, 1931). 1,000 preference and 30 ordinary shares taken up. £1,030 paid. Mortgages and charges, nil.

R. Alger & Sons, Ltd.—Capital £20,000 in 5,000 preference and 15,000 ordinary shares of £1. Return dated January 6th (filed April 22nd), 1931. 3,000 preference and 11,960 ordinary shares taken up. £4,960 paid. £10,000 considered as paid. Mortgages and charges, £2,352.

Tyneside Investment Trust, Ltd. (formerly Tyneside Electrical Development Co., Ltd.).—Capital £250,000 in 150,000 5 per cent. cumulative preference and 100,000 ordinary shares of £1. Return dated April 9th, 1931. All shares taken up. £250,000 paid. Mortgages and charges, nil.

Yorkshire (West Riding) Electric Tramways Co., Ltd.—Capital £600,000 in 350,000 6 per cent. cumulative preference and 250,000 ordinary shares of £1. Return dated April 29th, 1931. 231,305 preference and 204,885 ordinary shares taken up. £436,190 considered as paid. Mortgages and charges, £256,168.

Willey & Company Holding Trust, Ltd.—Capital £500,000 in 150,000 preference and 350,000 ordinary shares of £1. Return dated April 13th, 1931. 125,000 preference and 350,000 ordinary shares taken up. £128,572 paid on 100,000 preference and 28,572 ordinary shares. £346,428 considered as paid on 25,000 preference and 321,428 ordinary shares. Mortgages and charges, nil.

Windsor Electrical Installation Co., Ltd.—Capital £150,000 in 50,000 5 per cent. preference, 25,000 7 per cent. preference, 50,000 ordinary and 25,000 unclassified shares of £1. Return dated March 10th, 1931. 23,532 5 per cent. preference, 25,000 7 per cent. preference, and 50,000 ordinary shares taken up. £73,532 paid. £25,000 considered as paid. Mortgages and charges, nil.

Electrical & Radio Products (1931), Ltd.—Debenture dated September 1st, 1931, to secure £4,225, charged on the freehold factory known as Empire Works and other premises at Salfords, Horley, Surrey, and the company's undertaking and property present and future, including uncalled capital. Holder: D. L. Honeyman, 9, Basinghall Street, E.C.

R. Roberts (Birmingham), Ltd.—Debenture dated September 4th, 1931, to secure £300, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Mrs. H. M. Roberts, "Croydon," Cranmore Road, Four Oaks, Warwickshire.

Engineering and Lighting Equipment Co., Ltd.—Mortgage dated September 8th, to secure £2,999, charged on Sphere Works, St. Albans, and benefit of two agreements dated November 6th, 1908. Holders: City of St. Albans Permanent Benefit Building Society.

Oliver Pell Control, Ltd.—Land registration charge on company's works and factories at Cambridge Place, Burrage Road, Plumstead, dated August 25th, to secure all moneys due to or to become due from the company to the Westminster Bank, Ltd.

Lincoln Smethurst, Ltd.—Trust deed dated August 31st, to secure a debenture for £4,500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.

Currys, Ltd.—Mortgage dated September 9th, to secure £1,000 and further advances, charged on 47 and 49, Toll Gavel, and 100 and 106, Walkergate, Beverley. Holders: Bradford Third Equitable Benefit Building Society.

Jarrow and District Electric Traction Co., Ltd.—Capital £60,000 in £1 shares. Return dated May 5th, 1931. 59,934 shares taken up. £49,945 paid. £9,989 considered as paid. Mortgages and charges at date of return, £1,400 (since paid off).

Mullard Wireless Service Co., Ltd.—Capital £10,000 in 5,000 "A" and 5,000 "B" shares of £1 each. Return dated June 11th, 1931. 4,600 "A" and 4,600 "B" shares taken up. £9,200 paid. Mortgages and charges, nil. Return of allotments, made up to June 12th, 1931, showed a further 400 "A" and 400 "B" shares allotted as fully paid.

Charing Cross Electricity Supply Co., Ltd.—Capital £2,450,000 in 400,000 preference, 1,100,000 ordinary, and 400,000 City Undertaking preference and 550,000 City Undertaking ordinary shares of £1 each. Return dated March 25th, 1931. 400,000 preference, 1,036,800 ordinary, 400,000 City Undertaking preference and 550,000 City Undertaking ordinary shares taken up. £1,280,000 paid on 400,000 preference, 480,000 ordinary and 400,000 City Undertaking preference shares. £1,106,800 considered as paid on the remainder. Mortgages and charges, £1,036,111.

Pritchett and Gold and E.P.S. Co., Ltd.—Capital £200,000 in 100,000 preference and 100,000 ordinary shares of £1. Return dated March 23rd, 1931. All shares taken up. £30,394 paid on 15,233 preference and 15,161 ordinary shares. £169,606 considered as paid on 84,767 preference and 84,839 ordinary shares. Mortgages and charges, nil.

Bloomsbury Wireless Co., Ltd.—T. H. Williams, of 350-352, Romford Road, Forest Gate, E.7, was appointed receiver and manager on September 4th, under powers contained in debenture dated March 4th, 1931.

Mid-Cheshire Electricity Supply Co., Ltd.—Capital £225,000 in 10,000 5 per cent. cumulative preference, 60,525 7 per cent. cumulative preference, 109,525 ordinary, and 44,950 unclassified shares of £1. Return dated April 10th, 1931. All preference and ordinary shares taken up. £178,599 paid on 10,000 5 per cent. preference, 60,225 7 per cent. preference, and 109,175 ordinary shares, leaving £801 calls unpaid. £650 considered as paid on 300 7 per cent. cumulative preference and 350 ordinary shares. Mortgages and charges at date of return, £18,250 6 per cent. mortgage debts.

Park Royal Engineering Co., Ltd.—Capital £50,000 in £1 shares. Return dated April 10th, 1931. 37,605 shares taken up. £36,605 paid. £1,000 considered as paid. Mortgages and charges, £12,000.

Midland Electric Wire Co., Ltd.—Capital £5,000 in £1 shares. Return dated June 15th, 1931. All shares taken up. £5,000 paid. Mortgages and charges, nil.

London Electric Wire Co. & Smiths, Ltd.—Capital £1,250,000 in 500,000 preference and 750,000 ordinary shares of £1. Return dated May 15th, 1931. 400,000 preference and 684,070 ordinary shares taken up. £350,035 paid on 350,000 preference and 35 ordinary shares. £734,035 considered as paid on 50,000 preference and 684,035 ordinary. Mortgages and charges, nil.

A. Reyrolle & Co., Ltd.—Capital £700,000 in 115,000 preference and 585,000 ordinary shares of £1. Return dated April 28th, 1931. 102,500 preference and 585,000 ordinary shares taken up. £678,795 15s. paid on the preference and 578,000 ordinary, leaving £1,704 5s. calls unpaid. £7,000 considered as paid on 7,000 ordinary shares. Mortgages and charges, nil.

Edison Storage Battery Distributors, Ltd.—Capital £12,000 in £1 shares. Return dated July 16th, 1931. 5,000 shares taken up. £5,000 paid. Mortgages and charges, nil.

Electric Lamp Distributors, Ltd.—J. Stone, of "Legality," Canvey Island, Essex, ceased to act as receiver on September 10th.

A. E. Acton-Burnell, Ltd.—G. Sunley, of 9-11, Copthall Avenue, E.C., ceased to act as receiver and manager on September 14th.

City Notes

The Compania de la Provincia de Buenos Aires reports that, despite increased consumption of electricity and a higher number of consumers, its receipts from Argentina decreased from £542,879 to £306,142, and the net profit from £165,752 to £76,178. To the net profit is added £37,265, being interest paid by the South American Power Co. on the price of the power stations transferred to it in January, 1930. A dividend of 5 per cent. is paid on the 8 per cent. participating preference shares (against 8 per cent.), and reserve receives £4,787.

Companies to be Struck off the Register.—The names of the undermentioned companies will be struck off the Register at the expiration of three months, unless cause is shown to the contrary: Baynton's Wholesale Wireless, Ltd., British Com bustion Turbines, Ltd., British Steam Turbines, Ltd., Derwent Valley Electric Power Co., Ltd., and Super Wireless, Ltd.

The Associated Telephone & Telegraph Co. has announced interim dividends of $1.75 per share on the 7 per cent. first preferred stock, $1.50 on the $6 first preferred stock, $1 on the $4 preference stock, $1 on class "A" stock, and an additional and participating dividend on class "A" stock of 50 cents per share.

The Western Electric Co. (U.S.A.) has, according to the daily Press, passed its quarterly dividend of 75 cents on its stock, 98 per cent. of which is held by the American Telephone & Telegraph Co.

The Westinghouse Electric & Manufacturing Co. has declared a quarterly dividend of 62½ cents per share on the common and preferred stocks.

The Tokyo Electric Light Co. reports a net profit of 9,039,105 yen for the half-year to May 31st last, as compared with 8,868,766 yen in the corresponding period of the preceding year. A dividend of 4 per cent. per annum is paid (same), and 4,498,308 yen is carried forward.

The Calgary Power Co. has announced a quarterly dividend of 1½ per cent. (same) on the common stock.

Hopkinsons, Ltd., have announced an interim dividend of 2½ per cent. on the ordinary shares (same).

The Midland Counties Electric Supply Co., Ltd., has declared an interim dividend on the ordinary shares for the half-year to June 30th at the rate of 5 per cent. per annum. A similar interim dividend was paid last year, but on smaller capital.

Imperial & International Communications, Ltd., in its monthly return of traffic receipts for August, shows a decrease of £76,764 at £334,326. The estimated aggregate receipts for the eight months to August 31st were £3,096,049, as against £3,656,033 for the corresponding period of 1930, a decrease of £559,954. The sum of £18,500 must be deducted from the figure for August, 1931, in making a comparison with August, 1930, owing to changed conditions of sharing traffic.

The Montreal Light, Heat and Power Co. reports net earnings for the first eight months of the year of $8,400,000, as compared with $7,893,000 for the corresponding period of 1930.—Reuter's Trade Service (Ottawa).

The British Columbia Power Corporation reports that the net earnings for the past year amounted to $5,022,000, as compared with $4,289,000 for the preceding year.—Reuter's Trade Service (Ottawa).

The Quebec Power Co. has announced the usual quarterly dividend of $$\frac{5}{8}$$ per share on the common shares.

Stocks and Shares

TUESDAY EVENING.

The Stock Exchange, after opening on a Saturday for the first time since April, 1917, was closed on Monday and Tuesday in this week in consequence of the state of affairs induced by the abandonment of the Gold Standard. This, together with the rise in the Bank Rate to 6 per cent., came as a sequel to the flood of constant Continental selling. The Government required that the Stock Exchange should be closed on Monday last, while the new Gold Act was passed into law. The Stock Exchange Committee ordered that the House should remain shut on the day following. Business was to be resumed on the following day. That there should be shrinkages in the prices of fixed interest stocks was inevitable in view of the devaluation of the £, but industrials went up by reason of the indirect tariff which this step implied.

Home Electricity Supply

Dealings on the first two days this week became suspended, so far as the ordinary course of business was concerned, but a certain amount of stock changed hands at prices which were agreed through the medium of negotiation. For the purposes of the Stock Exchange Settlement, which takes place on the Thursday in this week, the basis of value was fixed by the closing prices on Saturday last, and these, accordingly, are taken for the compilation of our usual lists of quotations. It will be observed that the variations in the shares of Home electricity companies are slight. Metropolitans are down 9d. at 38s. 9d. Midland Counties at 26s. 3d. show a similar fall. The company has declared an interim dividend on the ordinary shares at the rate of 5 per cent. per annum, payable on October 15th. This is the same as that declared a year ago, but is payable on more shares than were in issue this time last year.

It is necessary to emphasise the fact that the prices quoted in our lists are nominal, because, if people wish to sell any of these shares, they may possibly find that dealing prices, upon the reopening of the Stock Exchange, will differ from those given in the Stock Exchange Official Lists. To companies concerned with home manufactures, the devaluation of the £ acts, as just mentioned, in the same way as a tariff upon imported goods, and therefore prices of shares in the iron, steel and coal group, for example, are quoted higher.

Dividends from Reserves

To revert to the Home electricity issues, however, the fact of the companies being governed by the new set of conditions that came into force under the Electricity Act, implies that the statutory dividends of the principal London companies will be, at any rate at first, not more than 7 per cent. On the other hand, there are expectations, already quoted here upon more than one occasion, that the companies will distribute from their reserves such additional shares as will enable the total income to be but little under that which shareholders are at present receiving through the payment of the present higher rates of dividend. It is, therefore, difficult to estimate in advance what attitude may be adopted by the holders of these shares—whether, that is to say, they will feel inclined to sell, in view of the forthcoming fixed dividends, or whether they will regard the industry as being likely to benefit from thinly veiled protection.

Whitehall Electric 7½ per cent. preference have fallen 2s., Calcutta Electric ordinary are easier at 29s. 6d., Northamptons have slipped back to 37s., and North Metropolitans, which were a good market, have receded to 42s. 9d. The premium on the Electrical Distribution of Yorkshire new shares is a trifle easier at 5s. 6d. Atlas ordinary have gone back to 14s.

Dollar Stocks

This country having forsaken the Gold Standard, it follows, *ipso facto*, that dollar stocks ought to improve. The New York Stock Exchange has taken with calmness the crisis on this side of the Atlantic. America has serious problems of

her own in the shape of unemployment and severe diminution in the profits of industrial companies. Such factors find reflection in the shares of Canadian Pacific utility companies; the group of electric supply, power and traction undertakings is out of favour. Most of the shares have gone back in price. To instance a few of the nominal quotations, Power Corporation of Canada shares are 37, Shawinigan 33¾, Brazilian Tractions 10½, Pennsylvania Water 55½, and Montreal Light and Power 38½. The Mexican issues show no alterations. Anglo-Argentine Tramways remain as before. Amongst Brazilian utilities, Rio Tramway 5 per cent. second bonds at 76½ are 5 points down, the first mortgage bonds continuing at 96½. San Paulo 5 per cent. debenture stock has dropped to 76½. The fighting between Japan and China is responsible for slightly lower prices in Tokyo Electric, Shanghai Electric and other such issues.

Cables and Wireless

Prices of the three stocks in Cables and Wireless have receded from one to six points. The two ordinary stocks have now fallen to figures at which the scope for further reduction is extremely limited, and, in fact, £100 of each class of stock can be bought for less than £60. Mark Tapley might have found consolation in the passing of this month's payment of the preference dividend on the stock by reference to the fact that the proprietor will not be called upon to pay the extra income tax for which otherwise he would have been liable. The Anglo-American group is a little easier, both preferred and deferred stocks of the Anglo-American Telegraph Company yielding ground. Great Northern Telegraphs remain weak at 22½. Marconi Marines have fallen to 28s. 9d. Of the dollar stocks, American Telephone and Telegraph shares at 160 are again five points lower, International Telephones at 21 being a point down.

The traffic receipts of Imperial and International Communications for August show an apparent drop of £76,764, of which £58,000 is an actual decline, the balance being due to the comparison being made with changed conditions of traffic.

Manufacturing and Equipment

After a general fall amongst industrial shares, prices strengthened on the Tuesday in this week. It is taken for granted that the stimulus afforded to home industries through the abandonment of the Gold Standard will materially benefit the manufacturing and equipment companies. Prior to the reopening of the Stock Exchange, G.E.C. ordinary had dropped to 36s. 3d., Enfields to 3⅜, and Associated Electrical Industries to 16s. 3d. Johnson & Phillips went back to 25s. Brush ordinary at 55 showed a fall of 5; stock changed hands down to 50. The argument runs that, under modified Protection, capital will seek ordinary stocks and shares for its employment rather than the fixed-dividend issues which are liable to heavy taxation. In other words, prosaic investment will be discarded, in many cases, for the livelier chances offered by speculative descriptions.

Home Railway Stocks

If home industries are going to be advantaged by the political change of front, Home Railways cannot help participating in the expected trade recovery. This is the contention used to explain substantial rises in the ordinary stocks of the steam railways. Underground Electric ordinary were 1s. down at 18s. 6d., and Districts a point, at 38½. These prices will probably be left well behind later in this week. The London traction issues are quiet.

Rubber shares have taken a further turn for the better, the produce firming up to a shade above 2½d. per lb. Iron and steel shares came into active request in the street market of Tuesday. Vickers are at 9s. compared with 6s. 9d. a fortnight ago. In spite of General Election talk, the Stock Exchange awaited with marked satisfaction the reopening of its doors on Wednesday in this week.

Larger Distribution Areas

Sir Hugo Hirst, Bart., writing in *The Times* Faraday issue, attributes the electrical "backwardness" of this country to prolonged effects of early legislation. Something more than the organisation of the production of electricity by the Central Electricity Board is necessary to ensure cheap electricity to the public. Diversity of demand is required, and that cannot be found in an undertaking supplying a restricted area as it can in a group of undertakings supplying a larger area. Upon the volume and variety of demands depends the cheapness of supply, and if all are to reap the fullest benefits of Faraday's genius we must include in our national scheme of electrical service every form of demand—without exception.

There are three main directions in which cheap electricity will have the most beneficial reactions. First, lower costs of production in industry; thus, many applications, such as to iron and steel furnaces and metallurgical processes, which are only sparingly used at present, await only a reduction in cost of electricity to become widely adopted and lead to the formation of new industries. Secondly, the all-electric home. Thirdly, rural electrification, which will be greatly assisted by the provision of mains for supplying the railways.

Every decrease in the cost of electricity through the lowering of prices tends to economies in production which make possible still further reductions.

Share List of Electrical Companies

Home Electricity Companies

	Nom.	Approx. Dividend. 1929.	1930.	Price, Sept. 19, 1931.	Rise or Fall.	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	57/6	—	5 4 2
Brompton Ordinary	1	8½	8½	28/6	—	4 18 3
Central Electricity 4½% Deb.	Stock	—	4½	94½	–1½	4 15 3
Charing Cross Ordinary	1	8½	8½	30/–	—	4 13 4
Chelsea	1	8½	8½	28/–	—	5 0 0
City of London	1	10	10	37/–	—	5 8 1
Clyde Valley	1	8	8	28/9	–⅛	5 11 4
County of London	1	11	11	41/3	–2/–	5 6 6
Edmundsons' 7% Pref.	1	7	7	26/–	—	5 7 8
Elec. Supply Corporation	1	11	11	42/6	—	5 3 6
Kensington Ordinary	1	8	8	29/6	—	4 15 0
Lancs. Light and Power	1	7	6½	21/3	—	6 2 4
London & Home Counties 4½% Deb.	Stock	—	—	95	–1	4 14 9
London Electric	1	8½	9	33/6	—	5 7 6
Metropolitan	1	9	10	38/9	–9d.	5 3 1
Midland Counties	1	6½	7	26/3	–9d.	5 6 8
Mid. Elec. Power	1	15	8	27/6	—	5 16 3
Newcastle-on-Tyne Ordinary	1	6	6	21/3	—	5 13 0
Do. 7% Pref.	1	7	7	27/6	—	5 1 10
Notting Hill 6% Pref.	10	6	6	11½	—	5 6 8
North Met. Elec. 6% Pref.	1	6	6	24/6	—	4 18 0
St. James' and Pall Mall	1	8	8	29/6	—	4 15 0
Scottish Power	1	8	8	26/3	—	6 2 0
South London	1	8½	8½	27/6	—	5 1 10
Urban Ordinary	1	7	7	28/3	—	4 19 1
Westminster Ordinary	1	8½	8½	29/–	—	4 16 7
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	22/9	–2/–	6 11 9
Yorkshire Elec.	1	8	8	30/–	—	5 6 8

Home Rails

Central London Ord. Assented	Stock	4	4	75	—	5 6 8
Metropolitan	,,	4	3½	35½	—	9 17 2
Do. District	,,	5	—	58½	–1	8 11 0
Underground Electric	1	8	8	18/6	–1/–	8 13 0

Telegraphs and Telephones

Anglo-Am. Tel. Pref.	Stock	6	6	101½	–1	5 18 1
Do. Def.	,,	1½	1½	24½	–½	6 2 4
Cables & Wireless 5½% Pref.	Stock	5½	5½	41½	–6	—
Do. A 7½% Ord.	,,	Nil	—	10	–2	—
Do. B Ord.	,,	Nil	—	6	–1	—
Globe Tel. and T. Ord.	10	10	8½	5	–½	—
Do. do. Pref.	10	6	6	7	–½	8 11 6
Great Northern Tel.	10	20	20	22½	—	8 17 10
Marconi-Marine	1	15	15	28/9	–⅛	10 8 8
Oriental Telephone Ord.	1	12	12	2½	—	*5 12 11

Home and Foreign Trams, etc.

Anglo-Arg. Trams First Pref.	5	5½	—	7/6	—	—
Do. do. 2nd Pref.	5	6	—	6/3	—	—
Do. do. 5% Deb.	Stock	5	5	18	—	—
British Electric Traction Def. Ord.	,,	5	5	700	—	—
Do. do. Pref. Ord.	,,	8	8	122½	—	6 10 9
Brazil Traction	100	8	—	10½	–3½	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	96½	—	5 3 3
London & Sub. Trac. 5% Pref.	1	Nil	Nil	10/–	—	—
London United Tram Deb.	Stock	4	4	60½	—	6 12 3
Mexico Trams, 5% Bonds	—	5	5	27½	—	18 3 3
Mexican Light Common	100	Nil	Nil	20	—	—
Do. 7% Pref.	100	7	7	50½	—	13 17 2
Do. 1st Bonds	—	5	5	57½	—	8 13 10
Victoria Falls Ord.	1	15	15	57/6	—	5 4 4
Yorkshire (West Riding)	1	Nil	Nil	6/3	—	—

Manufacturing Companies

Assoc. Elec. Ord.	1	6	6	16/3	–½	7 7 5
Do. Pref.	1	8	8	28/3	—	5 12 3
Babcock & Wilcox	1	15	14	42/6	–1/3	*6 12 0
British Aluminium Ord.	1	10	10	21/3	—	9 8 2
British Insulated Ord.	1	15	15	2⅞	—	6 2 6
Brush Ord.	Stock	10	5	55	–5	9 1 10
Callenders	1	15	15	2⅛	—	6 6 4
Do. 6½% Pref.	1	6½	6½	26/3	—	4 19 1
Crompton Parkinson Ord.	5/–	30	30	1	—	7 10 0
Do. 8% Pref.	1	8	8	28/3	—	5 13 3
Edison-Swan 1st Pref.	1	7½	7½	22/9	—	6 11 10
Do. 5% Deb.	Stock	5	5	92½	—	5 8 1
Electric Construction	1	5	Nil	10/–	—	—
Enfield Cable Ord.	1	25	25	3⅜	–¼	6 18 4
English Electric	1	Nil	Nil	5/–	—	—
Do. do. Pref.	1	Nil	Nil	5/–	—	—
Ferranti Pref.	1	7	7	20/–	–3	7 0 0
G.E.C. Pref.	1	6½	6½	23/6	—	5 10 8
Do. Ord.	1	14	10	36/3	–1/9	5 10 4
Henley	1	30	30	4⅝		6 10 5
Do. 4½% Pref.	5	4½	4½	4⅝	—	5 2 10
India-Rubber	1	Nil	Nil	4/6	—	—
Johnson & Phillips	1	10	10	25/–	–½	8 0 0
Siemens Ord.	1	7½	7½	20/–	—	7 10 0
Telegraph Construction	12	10	7½	10½	—	8 11 0

* Dividends paid free of Income Tax.

Swiss Foreign Electrical Trade

Imports and Exports in 1929 and 1930

THE following statistics, showing the import and export trade of Switzerland in electrical and allied goods in 1930, have been taken from the recently issued official trade returns. The figures for 1929 have also been given, and notes added of any increases or decreases. The returns show the most important of the countries of origin or destination of the goods.

Imports

	1929. Thous. fr.	1930. Thous. fr.	Inc. or dec. Thous. fr.
Electrical cable, not insulated—			
Total	60	112	+ 52
From Germany	29	24	— 5
„ France	24	85	+ 61
Insulated cable not lead covered or iron armoured—			
Total	309	428	+ 119
From Germany	262	273	+ 11
„ France	27	13	— 14
„ Holland	*	109	—
Cable covered with lead—			
Total	57	102	+ 45
From Germany	56	65	+ 9
Cable covered with lead and iron armoured—			
Total	137	219	+ 82
From Germany	137	171	+ 34
Cable insulated with rubber or paper and covered with textiles—			
Total	789	784	— 5
From Germany	332	289	— 43
„ France	60	65	+ 5
„ Holland	269	197	— 72
„ Great Britain	9	5	— 4
„ Belgium	100	196	+ 96
Cable ditto covered with lead—			
Total	557	273	— 284
From Germany	471	214	— 257
Dynamo-electric machines and transformers—			
Total	4,366	3,590	— 776
From Germany	2,265	2,090	— 175
„ France	314	360	+ 46
„ Italy	156	192	+ 36
„ United Kingdom	214	170	— 44
„ United States	449	374	— 75
„ Holland	888	276	— 612
Accumulators and batteries—			
Total	6,321	6,078	— 243
From Germany	3,001	2,759	— 242
„ Italy	97	106	+ 9
„ France	660	658	— 2
„ United States	193	260	+ 67
„ Austria	187	133	— 54
„ United Kingdom	2,045	2,040	— 5
Electric incandescent lamps, mounted—			
Total	3,550	3,750	+ 200
From Germany	1,200	1,096	— 104
„ Austria	294	330	+ 36
„ Holland	1,560	1,770	+ 210
„ France	210	305	+ 95
„ Hungary	200	135	— 65
Insulators, mounted—			
Total	486	1,190	+ 704
From Germany	296	880	+ 584
„ Denmark	133	287	+ 154
Electric meters—			
Total	823	845	+ 22
From Germany	682	720	+ 38
„ France	55	46	— 9
Telegraph and telephone apparatus—			
Total	16,420	19,410	+ 2,990
From Germany	5,721	7,910	+ 2,189
„ United Kingdom	799	720	— 79
„ France	589	460	— 129
„ Belgium	2,480	2,450	— 30
„ United States	856	1,250	+ 394
Electrical apparatus not elsewhere mentioned—			
Total	4,619	5,165	+ 546
From Germany	3,018	3,190	+ 72
„ France	188	210	+ 22
„ United Kingdom	888	290	— 598
„ United States	187	180	— 7

Exports

	1929. Thous. fr.	1930. Thous. fr.	Inc. or dec. Thous. fr.
Dynamo-electric machines and electric transformers—			
Total	37,625	37,380	— 245
To Germany	1,738	2,648	+ 910
„ Austria	974	253	— 721
„ France	3,052	5,675	+ 2,623
To Italy	1,523	1,674	+ 151
„ Belgium	2,772	2,710	— 62
„ United Kingdom	1,259	647	— 612
„ Egypt	867	390	— 477
„ Spain	3,874	4,620	+ 746
„ British India	460	320	— 140
„ Poland	2,701	1,140	— 1,561
„ Rumania	1,252	2,232	+ 980
„ Brazil	695	350	— 345
„ Argentina	1,304	1,360	+ 56
„ Netherlands	1,627	2,390	+ 763
„ Norway	1,623	375	— 1,248
„ Netherland Indies	1,348	1,125	— 223
„ China	529	535	+ 6
„ Japan	905	1,195	+ 290
„ Peru	87	305	+ 218
„ Australia	832	473	— 359
Accumulator batteries—			
Total	655	720	+ 65
To France	27	154	+ 127
„ Italy	18	137	+ 119
„ United Kingdom	47	16	— 31
„ Argentina	394	129	— 265
Insulators, mounted—			
Total	176	377	+ 201
To Holland	2	31	+ 29
„ Spain	82	34	— 48
„ Rumania	4	38	+ 34
Electric cable, not insulated—			
Total	2,416	2,135	— 281
To France	74	40	— 34
„ Austria	399	240	— 159
„ Italy	106	222	+ 116
„ United Kingdom	846	557	— 289
„ Czecho-Slovakia	194	206	+ 12
Cable, insulated, not lead covered or iron armoured—			
Total	1,122	917	— 205
Cable, lead covered—			
Total	86	91	+ 5
To Spain	9	13	+ 4
„ Poland	40	*	—
„ Egypt	*	26	—
Cable, lead-covered and iron armoured—			
Total	152	70	— 82
Cable, insulated with rubber or paper and covered with textiles—			
Total	666	640	— 26
To France	39	57	+ 18
„ United Kingdom	490	344	— 46
„ India	58	26	— 32
„ Denmark	*	90	—
Cables, ditto, covered with lead—			
Total	40	103	+ 63
To United Kingdom	*	57	—
„ Rumania	*	24	—
Electric locomotives—			
Total	626	2,630	+ 2,004
To Spain	115	360	+ 245
„ India	88	2,010	+ 1,922
„ Venezuela	—	125	+ 125
„ Brazil	380	—	— 380
Telegraph and telephone apparatus—			
Total	1,363	1,987	+ 624
To France	318	236	— 82
„ Italy	146	306	+ 160
„ Germany	57	80	+ 23
„ Holland	66	18	— 48
„ Greece	11	420	+ 409
„ United Kingdom	91	87	— 4
„ Belgium	50	76	+ 26
„ Chile	2	260	+ 258
„ Bolivia	*	117	—
Incandescent lamps, mounted—			
Total	4,100	4,150	+ 50
To France	120	135	+ 13
„ Italy	330	140	— 190
„ Holland	1,950	1,660	— 290
„ Denmark	44	450	+ 406
Electric meters—			
Total	19,426	19,770	+ 344
To France	2,750	2,890	+ 140
„ Belgium	1,850	2,240	+ 390
„ United Kingdom	2,240	2,560	+ 320
„ Czecho-Slovakia	1,680	1,970	+ 290
Electrical apparatus not elsewhere mentioned—			
Total	17,210	19,640	+ 2,430

* Not specified.

Electricity Supply in Ontario

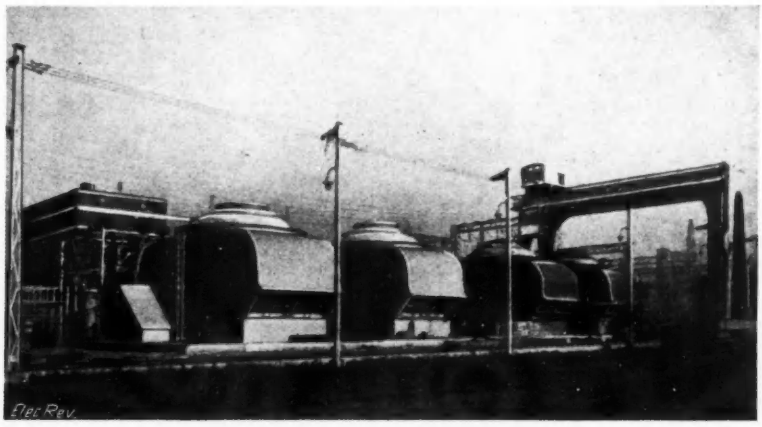
Extracts from the Annual Report of the Hydro-Electric Commission

THE twenty-third annual report of the Hydro-Electric Power Commission, covering the year ended October 31st, 1930, has recently come to hand. Containing almost 500 pages, the volume deals even more exhaustively than in previous years with the activities of the Commission in all departments and, in addition, gives financial statements of the municipal electrical utilities operating in conjunction with the various systems of the Commission and supplying electrical service to the province.

Power for the several systems is now obtained from thirty-seven hydro-electric plants operated by the Commission, supplemented by power purchased from other sources. During the year the Commission purchased the properties of the Dominion Power and Transmission Co., Ltd., for the sum of $21,000,000, the capacity of the generating plants, together with the contracts for the power purchased, amounting to 83,900 h.p. A large number of municipalities and industrial consumers are now supplied in the district between Port Colborne and St. Catherines to Hamilton, Brantford and Oakville, and at the end of the financial year the number of the municipalities in the province receiving supplies had reached 668. This number included 26 cities, 94 towns, 251 villages and police villages, and 297 townships.

Constructional Activities

The principal constructional activities of the Commission during the year comprised the putting into service of the tenth unit at Queenston generating station on the Niagara River, the virtual completion of the Alexander power development on the Nipigon River, substantial progress in the Chats Falls development on the Ottawa River, the completion of the second 220,000-V circuit on separate towers of the transmission line conveying Gatineau power from the Ottawa River to Leaside, Toronto, the addition of transformer capacity to many transforming and distributing stations, and the construction of no fewer than 1,890 miles of rural power lines.



The Toronto-Leaside Transforming Station

The virtual completion of the Alexander power development in October and the placing in service of the first generating unit followed a season in which construction work was carried on very rapidly in order to take full advantage of the favourable weather during the summer months for the building of the main dam, which is a semi-hydraulic earth fill. This is the first dam of this type built by the Commission. The growth in load in the Thunder Bay system has been striking, especially when it is remembered that not many years ago doubt was expressed as to the possibility of the then partial development at Cameron Falls finding sufficient load to justify its construction. The load demands have, indeed, been such as to necessitate the completion of the Cameron Falls development and the addition of the new Alexander development. Further studies and surveys are being made of the undeveloped water power on the Nipigon River between Cameron Falls and Lake Nipigon. Rapid progress is also being made in the design and construction of the new development at Chats Falls on the Ottawa River, where 192,000 h.p. will ultimately be available.

The second link between the Gatineau River plant and the Niagara system at Toronto-Leaside has been made by the completion of the second 220,000-V circuit. This double-circuit line now in operation provides sufficient transmission capacity to deliver all the power required at present from the east for the Niagara system. At the Toronto-Leaside transformer station (a picture of which appears above) considerable extensions have been made for the purpose of receiving the final blocks of power under the present Gatineau contract. These extensions include the erection of the third and fourth 25,000-kVA synchronous condensers and the third and fourth banks of transformers.

Finance

The total investment of the Commission in power undertakings and hydro-electric railways is $260,593,779.36, and the investment of the municipalities in distributing systems and other assets is $99,054,262.47, making in power and hydro-electric railway undertakings a total investment of $359,648,041.83. The total revenue obtained from municipal electrical utilities and other power consumers totalled $28,555,998, and after providing for all operating and administrating expenses there was a net surplus of $1,262,457, which compares with $1,575,225 in the preceding year. The total reserves of the Commission and the municipal electrical utilities for sinking fund, renewals, contingencies, and insurance purposes amount to $103,857,683.

During the past few years very substantial progress has been made in rural electrification, and practically all rural electrical service is now given through rural power districts, which are operated directly by the Commission. There is now rather more than $12,665,000 invested in the rural power district systems established by the Commission. A total of 6,726 miles of transmission lines have now been constructed, of which 1,891 miles were constructed during the past year. There are now more than 46,000 consumers supplied in the rural power districts.

Increase in Load

In spite of the general industrial depression, it is interesting to note that the load on the systems continues to advance. The abnormally large increase of 23 per cent. in the load during the fiscal year 1928-29 appeared to be the natural result of the prosperous conditions then prevailing, and it is, therefore, all the more remarkable that during the past year the consumption of electricity reached an even higher total. The only evident effect of the depression appears in the small ratio of the increase in the load this year as compared with ratios for previous years.

A dry summer season caused a reduction in the output of some of the Commission's plants, the Nipissing district and the Georgian Bay systems being the most severely affected. In the Nipissing district restrictions had to be placed on the load at the end of 1929, but the completion of the Elliott Chute generating station with a normal capacity of 2,400 h.p., prevented the shortage of power becoming as severe as would otherwise have been the case. The effect of the dry season was less in the Central Ontario and Rideau districts, and because of power available under the Gatineau contract no difficulty was experienced in supplying the loads.

Research and Testing

The work of the laboratories continues to increase in volume, and every opportunity is taken to keep abreast with the latest developments in testing and inspection methods, and in the application of new scientific discoveries with the problem of operation. The examination of concrete structures in service has been one of the investigations that has been actively continued by the Engineering Materials Laboratory, some fifty additional structures having been inspected during the year.

The Approvals Laboratory received 655 applications for approval reports, an increase of 38 per cent. over the preceding year, but there was a slight falling-off in the number of applications received for the listing of devices approved by the Underwriters' Laboratories, the total number amounting to 168.

A summary of the year's operations of the Electrical Inspection Division shows that 95,229 permits were issued, a decrease of 647 as compared with the preceding year. The total number of inspections made was 186,891, this being a decrease of 2,799. Nine fires were reported as having been caused by defective electric wiring or apparatus, and five persons were killed through coming into contact with live equipment. Two of these deaths were accidental, but the other three were the result of carelessness.

In January, 1930, the second edition of the Canadian Electrical Code, Part I, was adopted by the Commission as the ninth edition of its Rules and Regulations and became effective throughout the province on June 1st, 1930.

The report proper concludes with a review of the operation of the Commission's electric railways, while the remainder of the volume is devoted to statistical information relating to the operation of each municipal undertaking. A complete index is appended, and there is a large-scale map of the area in which the Commission operates. The publication also contains a number of excellent photographs.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Gas and Electricity

When I read your footnote to my letter on the above subject in last week's issue, I had to turn to your front cover to assure myself of your title and the scope of your journal, because it seemed to me that you had made my communication a text for gas propaganda.

In writing the letter at all I did not think I was giving the "oldest electrical paper, established 1872" (to quote your subtitle) an excuse to advertise an industry which has its publicity organised on a highly intensive scale, and which in its own journals is sparing of eulogistic references to the great electrical interests which you yourselves purport to represent.

W. E. WARRILOW.

Oxhey, Herts, *September 21st*, 1931.

[We publish Mr. Warrilow's letter because we learn that others also have misinterpreted what we had intended for sarcasm, when we pointed out that, after all, the best way of using coke for water heating—as the gas people so often urge us to do—was to burn it at an electric power station.—EDS., ELECTRICAL REVIEW.]

Art Painted Shades

The writer would be obliged if the manufacturers of art painted shades, &c., with religious illustrations or decorations of Roman Catholic interest would communicate with him. He has been endeavouring for some time past to get into communication in the ordinary business way with firms making a speciality of this kind of work in England, but without success. There are, however, at least two foreign firms supplying these articles.

P. T. WHITE.

Drumreagh House, Rostrevor, Co. Down, Ireland.
September 21st, 1931.

Installation Work in a Shipyard

I was interested to read the letter from "Electrician" in your issue of August 21st. From the details he gives, the installation would appear to be quite serviceable, although it must be remembered that the shipyard workers have very little sympathy with the electricians' ambition to obtain an ideal trouble-free system. Their respective requirements clash, and the latter must justly yield to the former.

The design of the system is definitely tied by two factors: (1) local conditions, and (2) the amount of money which the owner is prepared to invest to avoid maintenance costs.

The systems may range from bare v.i.r. cables slung across "uprights" to an armoured underground cable system laid in steam piping with joint boxes in tanks, the whole being run in a concrete trough, drained, and covered with removable chequer plates. The system ought to be underground to avoid damage from swinging plates, &c.; it must be semi-portable in cases where "uprights" are adjustable; and it must be made as "water-resisting" as the circumstances permit. As to the last, a watertight system could easily be achieved by using a lead-covered and armoured "ite" cable were it not for the grave problem introduced by "shores" being anchored by means of steel pegs driven into the ground without regard to the buried cables.

I have seen installations where ordinary v.i.r. cables were drawn into steel pipes without any serious attempt at making the pipes watertight and I have been amazed at the service and lack of trouble resulting.

It would seem that the installation quoted by "Electrician" is an improvement on this, in so far as the "ite" type of cable is much more durable under these conditions, especially if water cannot lodge permanently in the pipes. If watertightness has been achieved so much the better.

The omission of hygroscopic covering on the cables in very wet conditions is an advantage.

INSTALLATION.

September 14th, 1931.

High-torque Motors

Prospective users of high-torque motors should bear two points in mind. Many ordinary squirrel-cage motors have quite enough starting torque for their purpose—in some cases nearly as much as the corresponding high-torque machine (this applies more at higher speeds than at lower ones). Where the latter machine scores is in its comparatively low starting *current*. The second point is that high starting torque is not always an unmixed blessing. There was a craze for such machines a little while ago, which died amidst a welter of broken gear-wheel teeth, slipping and jumping belts, and "replacements."

I am not criticising Mr. D. S. Sandeman's remarks or denying the virtues of high-torque motors in suitably selected cases. These are merely comments arising from considerable practical experience with such machines.

STANDARDISATION

September 17th, 1931.

Power in Industry

The figures quoted by "All-electric Drive," in the ELECTRICAL REVIEW of September 18th, show that in 1929-30 the revenue obtained by authorised undertakings in Great Britain from the sale of energy for motive power worked out at an average of 0.82d. per kWh sold. It is somewhat disconcerting to find that over 90 per cent. of these undertakings obtained *more* than 0.82d. per kWh sold for power.

The following list sets out the undertakings which obtained less than 1.50d. per kWh sold for power only, in 1929-30, starting with those below 0.60d. per kWh, and going up by 0.10d. in groups to 1.50d. per kWh.

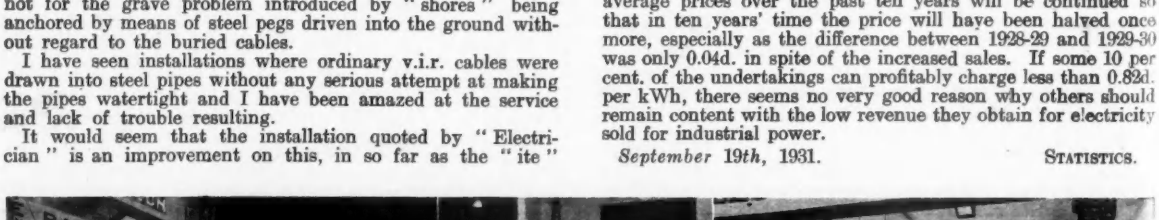
The number of undertakings which obtained an average of less than 1.50d. per kWh was 275, within the following ranges:—10 undertakings less than 0.61d. per kWh; 16 between 0.61d. and 0.70d.; 34 between 0.71 and 0.80; 36 between 0.81d. and 0.90d.; 38 between 0.91d. and 1.00d.; 38 between 1.01d. and 1.10d.; 33 between 1.11d. and 1.20d.; 21 between 1.21d. and 1.30d.; 27 between 1.31d. and 1.40d.; and 22 between 1.41d. and 1.50d.

The remainder (about 350 undertakings) obtained more than 1.50d. per kWh sold per hour.

It is obvious, therefore, that cheap energy for electrical driving was available only in certain parts of Great Britain in 1929-30; it is, therefore, incorrect to assume that it is on tap at an average of 0.82d. per kWh for motive power throughout the country. No doubt this matter is receiving the attention of all concerned.

It is probably too much to expect that the reduction in average prices over the past ten years will be continued so that in ten years' time the price will have been halved once more, especially as the difference between 1928-29 and 1929-30 was only 0.04d. in spite of the increased sales. If some 10 per cent. of the undertakings can profitably charge less than 0.82d. per kWh, there seems no very good reason why others should remain content with the low revenue they obtain for electricity sold for industrial power.

September 19th, 1931. STATISTICS.



Three stands at the Shipping and Engineering Exhibition: The Marconi Group; the Radio Communication Co., Ltd., showing a model of a mast of the type supplied to three of the B.B.C.'s stations; and W. T. Henley's Telegraph Works Co., Ltd., including model "grid" towers and a model of the new straight-through lead press.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1929

25,115. "Thermionic valves." C. S. Franklin. May 29th, 1930. (355,779.)

1930

6,072 "Electric potential indicating devices." Edison-Swan Electric Co., Ltd., E. Greetham, and G. F. Shotter. February 24th, 1930. (Cognate application 38,738/30.) (355,692.)

6,239. "Automatic starting of asynchronous dynamo-electric machines." Forges et Ateliers de Constructions Electriques de Jeumont. May 15th, 1929. (Addition to 35,799/29.) (355,651.)

6,276 "Telephone systems." Telefonaktiebolaget L. M. Ericsson. February 28th, 1929. (355,780.)

9,489. "High-potential measuring transformers." Koch & Sterzel Akt.-Ges. March 27th, 1929. (355,675.)

10,580. "Protective relay systems for electrical networks." Allmänna Svenska Elektriska Aktiebolaget. August 7th, 1929. (355,834.)

11,931. "Manufacture of electrical insulating materials." Non-Inflammable Film Co., Ltd., and V. E. Yarsley. April 15th, 1930. (355,654.)

12,807. "Electric discharge devices." British Thomson-Houston Co., Ltd. April 26th, 1929. (355,728.)

12,861. "Cooling means for closed electrical motors, generators, or the like machines." Aktiebolaget Ljüngstroms Angturbin. May 2nd, 1929. (355,658.)

12,862. "Cooling arrangements for closed electrical motors, generators, or the like dynamo-electric machines. Aktiebolaget Ljüngstroms Angturbin. May 3rd, 1929. (355,785.)

13,006. "Junction boxes for joining electric cables and conductors." A. C. Clark. April 28th, 1930. (355,729.)

15,198. "Cooling devices for electrical generators." Aktiebolaget Ljüngstroms Angturbin. May 28th, 1929. (355,677.)

15,337. "Alternating current electric motors." Hammond Clock Co. May 20th, 1929. (355,730.)

15,359. "Method of propagating endothermic reactions in electric arc furnaces." Buffalo Electric Furnace Corporation. June 27th, 1929. (355,700.)

15,375. "Means for supporting resistor coils in electric furnaces." D. F. Campbell and Electric Furnace Co., Ltd. May 19th, 1930. (355,701.)

15,622. "Telegraph systems." Creed & Co., Ltd., and R. G. Griffith. May 21st, 1930. (355,788.)

15,625. "Electrical methods of obtaining current impulses of predetermined frequency and shape." Standard Telephones & Cables, Ltd., T. S. Skillman, R. S. G. Terry, A. H. Roche, and M. E. Federici. May 21st, 1930. (355,666.)

15,664. "Electromagnetic relays." S. Dunlop (Fuld & Co. Telephon und Telegraphenwerke Akt.-Ges.). May 21st, 1930. (355,667.)

15,667. "Electric totalisators." Automatic Telephone Manufacturing Co., Ltd., and F. T. Belas. May 21st, 1930. (355,680.)

15,894. "Electrical measuring systems and apparatus therefor." Standard Telephones & Cables, Ltd. (A. H. Reeves). May 23rd, 1930. (355,705.)

15,935. "Thermionic valve circuits." Marconi's Wireless Telegraph Co., Ltd., and E. Green. May 23rd, 1930. (355,670.)

15,936. "Electric remote-control systems." Marconi's Wireless Telegraph Co., Ltd., and A. T. Witts. May 23rd, 1930. (355,706.)

16,063. "Apparatus for the transmission and/or reproduction of views, scenes, and other objects by electrical means." P. E. Maloney. May 24th, 1930. (355,795.)

16,213. "Combined electric switches and fuses." C. Brown. May 26th, 1930. (355,689.)

16,229. "Electrical signalling systems." Automatic Telephone Manufacturing Co., Ltd., J. Smith, and G. D. Turton. May 26th, 1930. (355,691.)

16,320. "Electric switch-fuses." British Thomson-Houston Co., Ltd., H. Trencham, and H. C. Heath. May 27th, 1930. (355,797).

16,442. "Overload switches." Igranic Electric Co., Ltd., and S. R. Wright. May 28th, 1930. (355,738.)

16,457. "Switching arrangement for telephone and like transmission systems." Standard Telephones & Cables, Ltd., P. R. Thomas. May 28th, 1930. (355,740.)

16,512. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., and C. E. Beale. May 28th, 1930. (355,746.)

16,515. "Electric current transformers." A. Reyrolle & Co., Ltd., and J. W. Bayles. May 28th, 1930. (355,747.)

16,571. "Electric motor control systems." J. H. Holmes & Co., Ltd., and H. Taylor. May 29th, 1930. (355,802.)

16,599. "Electrostatic sound reproducers or transmitters." E. Banning. August 9th, 1929. (355,806.)

16,765. "Telephone systems." Standard Telephones & Cables, Ltd., E. P. G. Wright, and R. A. Harker. May 30th, 1930. (355,820.)

16,829. "Receiving apparatus for electromagnetic waves." J. Robinson. May 30th, 1930. (355,828.)

17,430. "Luminous electric discharge tubes." Claude Neon Lights, Inc. June 26th, 1929. (355,844.)

18,278. "Contact devices for use in electric circuits." British Insulated Cables, Ltd., and R. W. Blades. June 14th, 1930. (355,859.)

18,596. "Mercury-vapour rectifiers." General Electric Co., Ltd., and E. Gallizia. June 18th, 1930. (355,865.)

18,898. "Electric plug couplings and the like." G. Marr. June 20th, 1930. (355,868.)

19,207. "Arrangement for starting a plurality of electric motors in sequence." Akt.-Ges. Brown Boveri et Cie. August 9th, 1929. (355,874.)

19,357. "Commutating dynamo-electric machines." English Electric Co., Ltd., and J. C. Wilson. June 25th, 1930. (355,876.)

19,374. "Plug-and-socket connections for use with electrical apparatus." H. B. Crofton and C. Crofton & Co. (Engineers), Ltd. June 25th, 1930. (355,877.)

19,836. "Electric coupling combined with a variable electric resistance." H. Rochat. July 1st, 1929. (355,883.)

19,861. "Variable-capacity electric condensers." A. Preen. June 30th, 1930. (355,884.)

20,401. "Plug couplings for use in combination with electric switches." J. B. Tucker. July 5th, 1930. (355,888.)

21,253. "Electro-optical systems for television and the like." G. B. Banks and Baird Television, Ltd. July 14th, 1930. (Cognate application 12,999/31.) (355,896.)

22,337. "Supporting structure for insulators for overhead electric conductors." F. C. Harber. July 24th, 1930. (355,906.)

22,369. "Rectifiers of high-voltage alternating electric current." B. L. Goodlet and Associated Electrical Industries, Ltd. July 24th, 1930. (355,907.)

22,600. "Multi-core electric cables." Callender's Cable & Construction Co., Ltd., and V. T. Burchall, and J. Bowyer. July 26th, 1930. (355,908.)

22,855. "Luminous electric discharge tubes." General Electric Co., Ltd. October 28th, 1929. (Addition to 315,391.) (355,910.)

23,674. "Automatic telephone systems." Siemens Bros. & Co., Ltd., and A. J. Escott. August 7th, 1930. (355,924.)

23,964. "Automatic telephone systems." Siemens Bros. & Co., Ltd., R. G. Dixon, and W. G. Patterson. August 11th, 1930. (Cognate application 3,358/31.) (355,927.)

25,055. "Protective devices for electric circuits." British Thomson-Houston Co., Ltd. August 21st, 1929. (355,940.)

25,432. "Submarine electric cables for communication purposes." Felten & Guilleaume Carlswerk Akt.-Ges. September 23rd, 1929. (355,945.)

25,620. "Electrical switches of the push-and-pull type." A. H. Whiteley. August 27th, 1930. (355,948.)

25,967. "Dynamo-electric machines." English Electric Co., Ltd., and R. D. Ball. August 30th, 1930. (355,951.)

26,378. "Electric switches of the tumbler type." J. A. Crabtree. September 4th, 1930. (355,957.)

27,161. "Electrolytic rectifiers and circuits therefor." H. J. Parker, E. A. Rea-Palmer, and A. G. Spence. September 11th, 1930. (355,965.)

27,340. "Manufacture of armoured electric cables and conductors." O. P. Wessel. September 21st, 1929. (355,966.)

27,386. "Electrical connections or junctions." H. G. Baggs. September 13th, 1930. (355,967.)

27,974. "Compressed-gas blow-out electric switches." S. Ruppel. September 26th, 1929. (355,975.)

28,091. "X-ray apparatus." British Thomson-Houston Co., Ltd. September 19th, 1929. (355,978.)

28,185. "Electric transformer tap-changing systems." Ferranti, Ltd., and E. D. Norris. September 20th, 1930. (355,979.)

28,442. "Circuit arrangement for igniting an electric discharge tube." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. November 27th, 1929. (355,982.)

28,937. "Electrical cable joint boxes." Telefonaktiebolaget L. M. Ericsson, and E. Olsson. September 26th, 1930. (355,986.)

29,147. "Coil-box junctions for deep-sea signalling cables." Felten & Guilleaume Carlswerk Akt.-Ges. October 12th, 1929. (355,989.)

29,222. "Electrical distribution boards, fuse boxes and the like." Simplex Conduits, Ltd., and H. F. McLoughlin. September 30th, 1930. (355,991.)

30,642. "Electric switches with arc-extinction by compressed gas." Siemens-Schuckertwerke Akt.-Ges. December 14th, 1929. (356,005.)

30,955. "Electric batteries." M. H. Goldstone (P. T. Elks). October 16th, 1930. (356,006.)

34,159. "Flickering devices for electric fires." G. Pate and J. R. Laird. November 13th, 1930. (356,039.)

34,681. "Submarine electric cables." Felten & Guilleaume Carlswerk Akt.-Ges. November 18th, 1930. (Addition to 355,945.) (356,041.)

36,211. "Coil boxes or junction sleeves for submarine cables." Felten & Guilleaume Carlswerk Akt.-Ges. December 2nd, 1929. (356,050.)

37,652. "Therapeutical lamps." A. K. Croad (Hanovia Chemical & Manufacturing Co.). December 13th, 1930. (356,056.)

1931

2,961. "High-frequency transmission line arrangements." Marconi's Wireless Telegraph Co., Ltd. March 12th, 1930. (356,085.)

9,406. "Apparatus for the transmission of pictures." British Thomson-Houston Co., Ltd. April 23rd, 1930. (356,093.)

12,774. "Electric transformers." International General Electric Co., Inc. April 30th, 1930. (356,097.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from September 16th :—

Rollator (lettering and design). No. 519,815. Class 6. Electric refrigerating machines and parts thereof. The Norge Corporation, Detroit, U.S.A. (British representatives: Frank B. Dehn & Co., Kingsway House, 103, Kingsway, W.C.2.)

Pye (lettering and design). No. 522,685. Class 8. Radio-telegraphic and telephonic apparatus and parts thereof.—Pye Radio, Ltd., Cambridge.

Doctor. No. 524,768. Class 8. Radio-telegraphic and telephonic instruments and apparatus.—C. B. Barton, 23, Union Road, Nottingham.

Pamphonic. No. 525,142. All goods in Class 8. Zenith Sound Reproduction Co., Ltd., 36, Albert Road, Regent's Park, N.W.8.

Platalie. No. 525,187. Class 8. Electrically-illuminated signs.—Claude-General Neon Lights, Ltd., Queen's House, Kingsway, W.C.2.

Marbo. No. 524,250. Class 13. Electric contacts, terminals, cut-outs, lampholders, plug couplings, electric switches (ordinary), combined electric switches and ceiling roses, lamp pendants and fittings, all being made of metal.—Marborun, Ltd., 120, Pratt Street, Camden Town, N.W.1.

Electroclone. No. 523,327. Class 18. Plant for separating liquid or solid particles from gases.—Lodge-Cottrell, Ltd., George Street, Parade, Birmingham.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Arundel (SUSSEX).—Reconstruction of head post office for H.M. Office of Works, King Charles Street, London, S.W.1.

Aylsham (SUFFOLK).—Houses (24) for the R.D.C.; surveyor.

Banff.—Reconstruction work at hospital, including electrical work (£9,590); the medical superintendent.

Barnsley.—School, Kendray Hill, for the R.C. managers; priest-in-charge.

Barton-on-Sea (HANTS).—Wesleyan church; Frederic Laurence. architect.

Bedford.—Offices, stores, workshops, &c., and alterations to various buildings for the Corporation; borough engineer. Houses (204), London Road estate; borough engineer.

Birmingham.—Rehousing scheme (£3,704,000); city engineer.

Bournemouth.—Housing scheme, Talbot Village; borough engineer.

Brampton (CUMBERLAND).—Clinic for the R.D.C.; G. A. Gray, surveyor.

Brighton.—Houses (74), Whitehawk estate (£27,726); Gay & Wilcox, Banbury.

Brownhills (STAFFS).—Houses (100) for the U.D.C.; surveyor.

Buckfastleigh.—Houses (24), Gypsy Lane, for the R.D.C.; L. M. Williams, Fore Street.

Caistor (LINCS).—Houses (60) for the R.D.C.; surveyor.

Campden (GLOS).—Houses (120) for the R.D.C.; surveyor.

Chard (SOMERSET).—Houses (74) for the R.D.C.; surveyor.

Cheshire.—School, Bebington (£27,995); Thomas Warrington, builder, Ellesmere Port. Senior school, Ellesmere Port (£38,400) for the county E.C.; director of education, Chester.

Consett (DURHAM).—R.C. school; Lough, builders, Higham Place, Newcastle.

Deal.—Houses (100), Millhill; Fawcett Martindale, architect, St. Neot's.

Dorchester.—Joint isolation hospital; borough engineer. Improvements, Royal Oak Hotel, High West Street; Eldridge, Pope & Co., Ltd.

Droitwich (WORCS).—Houses (66) for the R.D.C.; surveyor.

Durham.—Alterations to St. Oswald's Church of England schools; C. W. Milburn, architect, Feethams, Darlington.

East Sussex.—Secondary school, Old Shoreham Road, Hove, for the E.C.

Edinburgh.—Arcade, new shop front, and alterations at North Bridge for Patrick Thomson, Ltd.; the manager.

Elgin.—School centralisation scheme (£8,000); architect, Moray & Nairn Education Committee.

Falkirk.—Buildings for Wm. S. Barr, aerated water manufacturer (£2,400); the manager.

Flockton (WEST RIDING).—Houses (22) for the U.D.C.; A. G. Gell, surveyor, Manor View.

Forehoe (NORFOLK).—Houses (150) for the R.D.C.; surveyor.

Fort William (INVERNESS-SHIRE).—Houses (48) for the T.C.; burgh surveyor.

Gainsborough (LINCS).—Houses (50), Haldane Street, for the U.D.C.; housing architect.

Galashiels.—Housing scheme for the Corporation; burgh surveyor.

Gillingham (KENT).—Dockyard pumping station for the T.C.; W. H. Radford & Son, engineers, Albion Chambers, King Street, Nottingham.

Girvan.—Electric lighting installation, McMaster Hall, for the T.C.; Mr. Ramsey, engineer, Glasgow.

Glasgow.—Bank, Castlemill Road, King's Park; North of Scotland Bank, Ltd. Bridge at Finnieston (£800,000); city engineer. Hall, Greenvale Street, for the Ancient Order of Hibernians Friendly Society; the secretary. Shops, Boydstone Road; Pollokshaws Co-operative Society, Ltd. Catholic school, Anworth Street, Tollcross, for the E.C.

Gloucestershire.—Institution extensions, Cheltenham (£4,000). Thornbury (£6,000), and Northleach (£3,000) for the county Public Assistance Committee; clerk, Gloucester.

Goole (YORKS).—Houses (39), Marshfield estate, for the U.D.C.; Bainbridge, Ltd., builders, Doncaster.

Gosforth.—Town planning scheme for the U.D.C.; surveyor.

Guildford (SURREY).—Congregational schools, for the trustees; Kelsall Armitage, architect, 130, Haverstock Hill, Belsize Park, London, N.W.3.

Haddington.—Installation of electric lighting at St. Mary's Church.

Hampton (MIDDLESEX).—Estate development, Laurel Road; H. & L. Sloggett. Alterations, Hampton Timber Co., Ltd., Castle House, High Street; R. H. C. Churchward.

Harrogate.—Branch premises, Harlow Hill, for the Harrogate & District Co-operative Society, Ltd.; G. A. Scaife, builder, Coppice Drive.

Hebburn (DURHAM).—Relief offices, Hedgley Road; county architect.

Hoole (CHESHIRE).—Houses (122) for the U.D.C.; surveyor.

Hull.—Wesleyan church, Darrington Bank estate; Gelder & Kitchen, architects, 120, Alfred Gelder Street.

Irish Free State (LIMERICK).—Extension of technical institute (£4,500) for the Board of Works.

Liverpool.—Houses (36), Burlington Street, for the C.C.; director of housing, Municipal Buildings, Dale Street. Church, Waterloo Road, Hill Side; F. Velarde, architect, 3, Abercromby Square. Extensions to Craines' Concert Hall and Entertainments Bureau, Hanover Street; Harris & Hobson, 6, Harrington Street.

Liversedge.—Enlargement to Millbridge Upper Council School, Vernon Road, for the Spenborough C.E.C.; R. Castle & Sons, Midland Bank Chambers, Cleckheaton.

London (CATFORD).—Stadium, Station Road; G. E. Marshall & partners. (FOREST HILL).—Development of Perry Rise estate; F. Durrant. (ILFORD).—Methodist schools, Eastern Avenue (£7,000), with lighting and heating; F. J. Coxhead, builder, Leytonstone. (LEWISHAM).—Rebuilding, 43-5, Lewis Grove; Express Dairy Co., Ltd. Theatre and cinema, Loampit Vale; W. E. Trent, architect. Market, High Street; H. Weston. Six shops and flats, Randlesdown Road; H. & J. Taylor. (SHOREDITCH).—Remodelling Haggerston library (£3,784); borough engineer. (WEST HAM).—Baths, Romford Road, Forest Gate; borough engineer. (CAMDEN TOWN).—Extensions, Library, Camden Street (£1,600); St. Pancras borough engineer. (KENTISH TOWN). —Housing scheme, Leighton Road and Lady Margaret Road; St. Pancras borough engineer.

Lossiemouth.—Houses (22) for the T.C.; burgh surveyor.

Malpas (CHESHIRE).—Houses (32) for the R.D.C.; R. Matthews, architect, Nantwich.

Manchester.—Bank, King Street, Brown Street, and Spring Gardens, for Midland Bank, Ltd., 5, Threadneedle Street, London, E.C.2; Whinney, Son & Austin Hall, architects, 37, Norfolk Street, London, W.C.2.

Merthyr Tydfil.—Offices and depôt for the Taf Fechan Water Supply Board; R. S. Griffiths & partners, architects, Tonypandy, Rhondda.

Middlesex.—Extensions to grammar school, Hampton, for the county E.C.

Middleton.—R.C. church for the St. Joseph's parish; rector.

Montrose.—Nurses' home (£33,591) for the Royal Asylum directors; J. A. Ogg Allan, architect, Aberdeen.

Newcastle-on-Tyne.—Conversion of Lower Condercum House into school for mentally defectives for the E.C.; W. Steele, city Engineer, Town Hall. Alterations to Shields Road premises of Hadrian Supply Co.; W. Riddle, architect, 53, Denham Terrace, Wallsend.

Northern Ireland (PENNYBURN, Co. DERRY).—Catholic church (£20,000); O'Hare, building contractors, Warrenpoint.

Northfleet.—Houses (80), Wombwell Park estate; U.D.C. surveyor.

Oldham.—Employment exchange for H.M. Office of Works, King Charles Street, London, S.W.

Oswestry.—Rebuilding of the Shropshire Orthopædic Hospital and Agnes Hunt Surgical Home, Park Hall; Taylor & Simister, architects, 29, Queen Street, Oldham.

Oxford.—Houses (62), Headington estate (£27,020); Walter Danks, Ltd., Eccleshall, Staffs. Additions, Arlosh Hall; Manchester College trustees. Business premises, 11, New Road; Davey's, Ltd.

Pershore (WORCS).—Post Office for H.M. Office of Works, King Charles Street, London, S.W.

Portland.—Houses (20) for the U.D.C.; Jesty & Baker, builders.

Portsmouth.—Methodist church, Purbrook; trustees.

Princes Risborough (BUCKS).—Extensions, Field Entomology Building, Forest Products Research Laboratory, for H.M. Office of Works, King Charles Street, London, S.W.

Purley (SURREY).—R.C. church, Gables estate; Rev. W. A. Pritchard, St. Gertrude's, Purley Road, South Croydon.

Rotherham.—Houses (177) for the R.D.C.; surveyor.

Sale.—Houses (15), Chapel Road; J. W. L. Foulkes, U.D.C. clerk.

Salisbury.—Methodist Union Memorial church, Bemerton; trustees.

Saltcoats.—Telephone exchange; architect, H.M. Office of Works, 122, George Street, Edinburgh.

Scarborough.—Buildings, Westborough (£63,000), for the Corporation; H. W. Smith, borough engineer.

Somerset.—School extensions, Weston-super-Mare, for the county E.C.; A. J. Toomer, county architect, Taunton.

Southampton.—New St. Alban's Church; H. A. Welch, architect, 7, New Square, London, W.C.2.

Southport.—R.C. school; parish priest, Hillside R.C. church.

Staffordshire.—Senior schools, Shelfield, for the county E.C.; education architect, Stafford.

Staincross.—Houses (34) for the U.D.C.; J. H. Hinchliff, architect, Barnsley.

Sunderland.—Two shops, St. Luke's Terrace, for Mr. Finn; F. W. Newby, architect, 37, King Street, South Shields.

Surrey.—School, Mitcham, for the county E.C.; W. W. Finny, secretary, Kingston-on-Thames.

Swanscombe (KENT).—Alterations to convent, High Street, Greenhithe; mother superior.

Swansea.—Housing scheme (twenty-five acres), Mayhill. Improvements to branch libraries, &c. Schools, West Cross and Baptist Well; borough architect. Alterations, Gem Cinema, Sway Road, Morriston; W. E. Ballard. Alterations, Fabians Bay Congregational Church; trustees. Factory extensions, Cockett Road; Strutton & Co.

Tonbridge.—Labour exchange, Avebury Avenue, for H.M. Office of Works, King Charles Street, London, S.W.

Twickenham.—Joint Isolation Hospital scheme; Corporation and neighbouring Councils.

Walsall.—Church, Field estate; Congregational trustees. Shops and offices, The Bridge (£3,631); J. R. Deacon.

Wallsend-on-Tyne.—Four shops, High Street; W. Riddle, architect, 53, Denham Terrace.

Walton-le-Dale.—Houses (24), Preston Junction; surveyor to the U.D.C.

Wantage (BERKS).—Houses (34) for the R.D.C.; surveyor.

Wednesbury.—Houses, Bilston Road (56) and Longcroft (30), for the T.C.; A. Booth, borough engineer and surveyor, Town Hall.

Wolverhampton.—Alterations and improvements to St. John's Church schools; J. Clark, builder, Pipers Row.

Workington (CUMBERLAND).—Houses (26) for the T.C.; borough surveyor.

Worthing (SUSSEX).—Municipal offices (£92,879) for the T.C.; Trollope & Colls, Ltd., builders, Coleman Street, London, E.C.